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American Foundryman

THE FOUNDRYMEN'S Own MAGAZINE

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This Month's Cover

Young patternmaker applying a wax fillet to a wood pattern with a fillet iron. Alcohol burner shown at bottom of picture is used to heat the iron which enables the patternmaker to work the wax into place.

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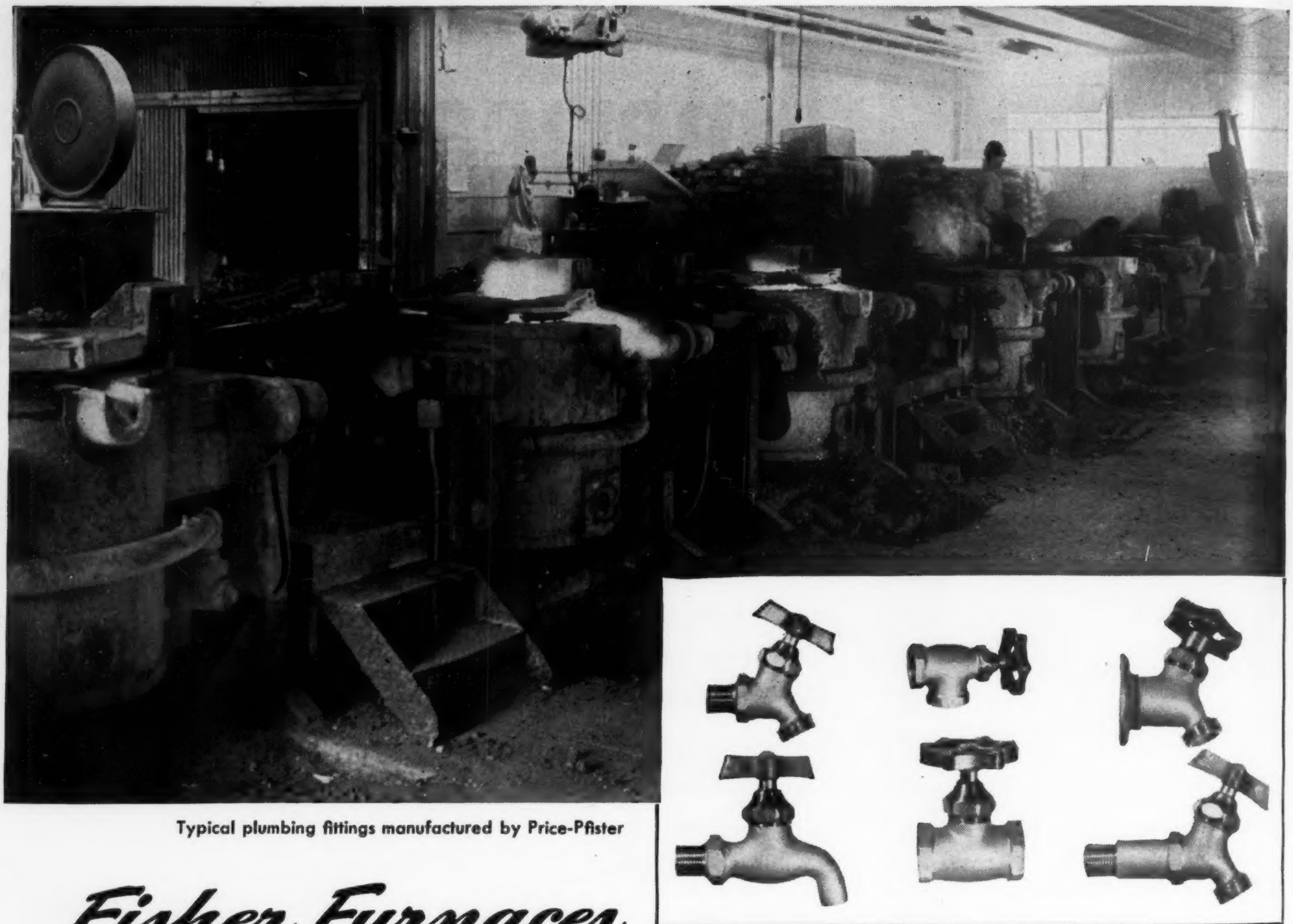


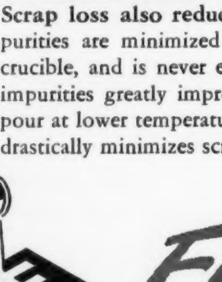
Typical plumbing fittings manufactured by Price-Pfister

Fisher Furnaces

HELP PRICE-PFISTER REDUCE METAL LOSS BY 85%

Price-Pfister, Los Angeles, well known manufacturer of plumbing supplies, in 1943 installed the first of 7 new Fisher Gas Fired Nose Pouring Crucible melting furnaces. These furnaces used for melting red and yellow brass alloys required for the manufacture of valves, fittings, faucets, etc., replace old style open flame furnaces.

Because there is no open flame to impinge on the surface of the metal to cause burn out, metal loss is drastically reduced.



Don Harper, foundry superintendent at Price-Pfister says: "*With the new Fisher Furnaces* our metal loss has dropped to about 15 pounds per ton. Our loss with the old furnaces ran to about 100 pounds a ton—so we save an extra 85 pounds. Brass is selling for 18½c a pound, so we save over $15.00 on each ton."

Scrap loss also reduced. Oxidation and resultant slag impurities are minimized because metal being melted is in a crucible, and is never exposed to an open flame. Absence of impurities greatly improves fluidity and makes it possible to pour at lower temperatures. This results in better castings and drastically minimizes scrap loss.

Special Features

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- Constant pouring arc regardless of degree of furnace tilt.
- Rate of pouring under positive and constant finger-tip control.
- Special trunnion mounting permits lower construction than hand tilting furnace.
- Reduced height facilitates charging cold metal and observation of melting.
- Metal waste and pouring hazard greatly reduced by closeness of ladle to pouring spout.
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THE FOUNDRYMAN

THE PRODUCER OF castings—that commodity so vitally essential to our modern civilization—is a man about whom the world at large knows but little and, until a comparatively recent period in the history of his industry, that is the way he wanted it. He was essentially a craftsman, and the arts of his craft were his closely guarded secrets.

What manner of man, then, is this producer of castings—the foundryman? He is not a molder, a coremaker, a metal melter, a cleaning room man, a machinist, a patternmaker, a sand control man, or a metallurgist. He is all of them in one, with a background of intensive training and practical experience.

The modern foundryman, however, requires a wider knowledge than the training and experience in the crafts of the industry alone can give him. He must be well grounded in all the fields of engineering. Problems in mechanical, electrical, civil, metallurgical and chemical engineering are a part of his daily life, and he must have sufficient knowledge of all phases to determine when and which specialist he needs to consult, and to be able to discuss intelligently with such a specialist his own immediate problem. He must have at least a modest business training, with a fair knowledge of cost accounting. It is always more pleasant for him to receive the accounting department's congratulations on a job run at a profit rather than their advice of a loss. He must, as a leader of men, have a working knowledge of theology, psychology and medicine. Of these, the use of psychology in his handling of men is quite important.

In fact, the foundryman must be able to stand on his own feet and face all the social, academic, commercial, industrial and technical problems that confront him day by day.

This outline could well give rise to the thought that the foundryman is not just an ordinary human being, but a "superman." However, that is not the case. The foundryman is just a man who is quite content to get a good day's production with a low scrap loss.

Surprising as it may seem, there is a fair supply of just such qualified men in the foundries today, and they are doing an outstanding job in the development and standardization of sound foundry practices. Unfortunately, however, the supply of replacement men of similar qualifications is limited and far below actual requirements, principally because in the past the industry had not taken the pains to assist in the development and education of such men, or to put out the necessary information in the universities and colleges to show the opportunities in the foundry which make it an attractive field of endeavor to young students.

It is indeed encouraging that the foundry industry as a whole has come to recognize that college students can be interested in the foundry and the opportunities it offers, and that various organizations of the industry have instituted a constructive educational program, with the sole objective of ensuring an adequate number of qualified men to "carry on" in the foundry.

E. N. DELAHUNT, *National Director*
AMERICAN FOUNDRYMEN'S ASSOCIATION

Elected a National Director at Detroit, E. N. Delahunt hails from Chester, Pa., and is an alumnus of Catholic University, Washington, D.C. During World War I served as a 1st Lieutenant in the Coast Artillery. Has been affiliated with Crane Company since 1920 and is now general superintendent, Warden King Ltd. (Division of Crane Ltd.), Montreal. Is past chairman of the A.F.A. Eastern Canada-Newfoundland chapter.

MACHINING CASTINGS

A. O. Schmidt
Research Engineer
Kearney & Trecker Corp.
Milwaukee

Machinability covers a large field and any attempt to analyze the subject must be restricted to fundamentals. There are so many kinds of castings that variations due to material and size will require different machining operations due to specific demands for accuracy, character of the surface finish and, last but not least, low cost.

Today, machining of high-strength steel castings no longer presents too difficult a problem, because the machines, tools and tool materials are available to process even hard and tough castings within a reasonable time and with a high degree of accuracy. Modern machine tools, improved cutting tool materials, and a better recognition of the important factors of improved machine shop practice provide economical ways to perform jobs which only a few years ago were considered quite difficult.

Machine tools developed recently have the power, the rigidity and strength built into them to work with accuracy. Their range of speeds and feeds will usually permit machining heavy steel castings as well as light magnesium castings.

Machine Tool Materials

Although the sintered carbides have received the largest share of publicity, and justly so, since their quality, especially in steel cutting grades, has improved a great deal, better high speed steel and cast alloys are also available and in many cases are preferred.

Machining gray cast iron with carbides has been done successfully for over 15 years. The radial rake (back rake) and axial rake (side rake) angles used were usually positive. The negative rake angles, so widely recommended for machining steel are not necessary for machining gray cast iron or any of the light metal alloys. These negative angles will provide a stronger tool but will also increase the power required for a particular cut. However, when an alloy steel casting needs machining, its high strength and hardness may be such that carbide tools and those of cast alloys will require negative rake angles.

High speed steel tools might do the job with positive rake angles at lower speeds and lighter feeds. For a particular cross-section of chip of given material the tool forces will be the same regardless of the tool material. In most cases in which a standard cutter is used the power available at the spindle will determine the permissible speeds and feeds, and thus the tool material. The power increases linearly with the cutting speed, the size of chips removed being the same.

Since any tool will dull during a metal cutting operation and thus increase the required power, it is good practice not to start out with an overloaded machine when the cutter is still sharp. Light metals will cause less wear than cast iron and, therefore, permit the same tool to remove more material, while alloy steel castings might be very abrasive and, therefore, dull even carbide tools very rapidly.

Basic Process the Same

Despite the great variety of machining operations, the basic metal cutting process is the same whether it be single-point turning, drilling, or milling. Besides having the proper cutting angles, which, in the case of turning and milling might be same, it is necessary to have a rigid setup holding the workpiece, and strong

Table I—Speed and Feed Selector Chart for Carbide Milling.

MATERIAL	FEED PER TOOTH
ALUMINUM	.010 - .030
BRASS - SOFT	.010 - .030
BRONZE	.005 - .015
BRONZE - HARD	.003 - .010
CAST IRON - SOFT	.010 - .030
CAST IRON - HARD	.005 - .015
CAST IRON - CHILLED	.005 - .010
MALLEABLE IRON	.010 - .030
STEEL - SOFT	.010 - .020
STEEL - MEDIUM	.007 - .015
STEEL - HARD	.003 - .010

cutting tools which, in high speed cutting, must permit unhampered chip flow, especially with ductile materials like aluminum, magnesium or steel castings.

Various methods have been used to establish machinability ratings. Determination of tool life—the time a tool will stand up under definite machining conditions, power consumption—the amount of power per cubic inch of metal cut, geometry and mechanics of the process of chip formation, and surface finish are now recognized as the most representative tests.

Investigators have found special equipment necessary in order to conduct and evaluate these tests. However, more simple methods have been devised in an attempt to gain an easier and faster way of determining the relative machinability of various materials.

The penetration test on a drill press in which a standardized drill works under a constant load and speed for a definite time has not been found reliable. This method assumes that the drill makes a hole with a depth proportional to the machining properties of the material tested. There exists a great deal of friction on the margin and chisel-edge point of the drill which often affects the drilling operation but is not present in other types of machining.

In the sawing test, which is widely employed, the time required to saw a test bar with a power hacksaw is measured. These time values can be used as an index in comparing the machinability of similar metals, but, because of the variable and indeterminate friction developed at the hacksaw blade, accurate and reliable values often cannot be established.

Hardness readings which are definitely related to other physical properties are often misleading as a measure of machinability.

Calorimetric Process Applied to Determination of Tool Forces

Another interesting method involves measurement of the temperature developed at the tool. For this purpose the tool and the test log are set up to act as the two elements of a thermocouple. The difficulty here is calibration, and the fact that often a built-up edge exists between the tool face and the chip.

The calorimetric analysis is a reliable and simple method of measuring the power required directly at the cutting tool. In these tests water is employed as a means of measuring the quantity of heat generated by a combination of friction and deformation during the cutting operation. To measure the quantity of heat thus generated, the tool and workpiece are submerged during the cutting operation in a specified quantity of distilled water. The temperature of the water at the beginning and end of the cutting operation is read from a thermometer set in the water container.

When work is transformed into heat, or heat into work, a quantity of work is the mechanical equivalent of a quantity of heat. Thus, by observing the temperature changes of the water surrounding the tool and workpiece during the cutting operation, it is possible to study the power requirements for the cutting of different materials and the effect of changes in tool design upon power consumption.

The test specimen and the cutting tool are arranged in a container so that both will be covered by water,

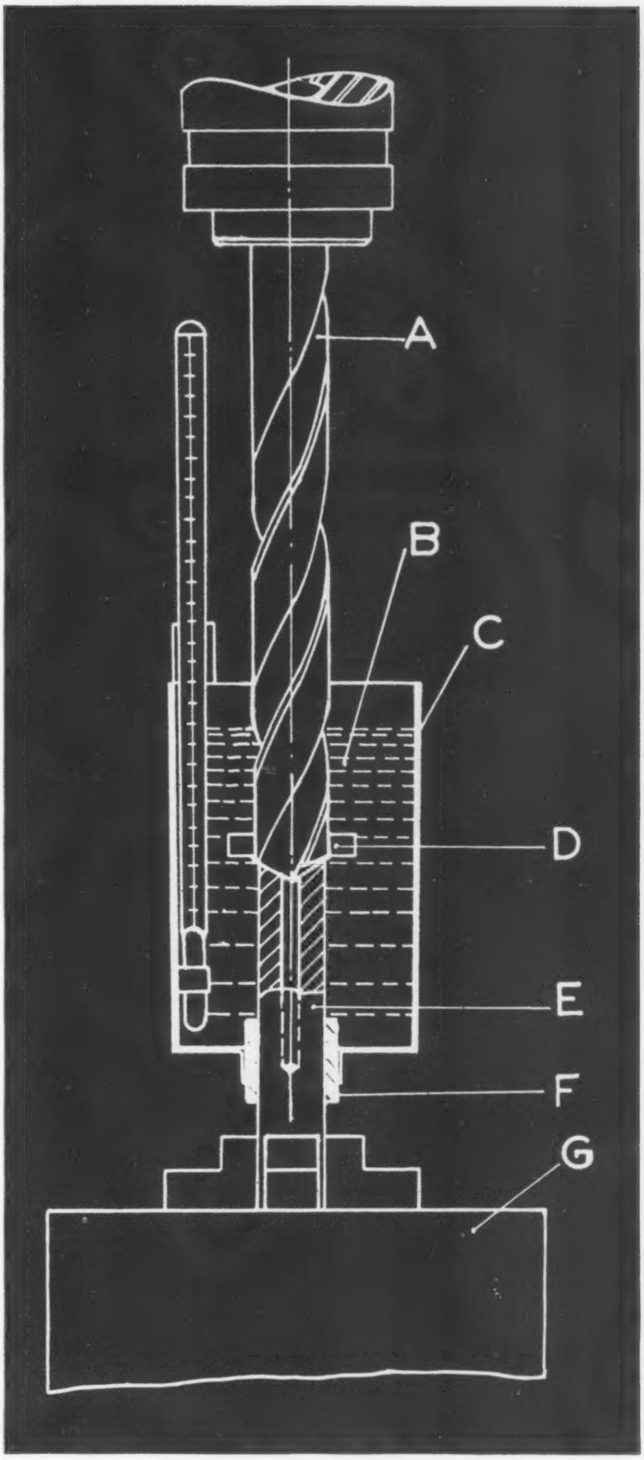

Fig. 1—Calorimetric apparatus for drilling tests: A—drill 7/16 in. diameter, B—50 cc of water, C—container, D—blades on drill for agitation, E—3/8 in. test bar, F—rubber grommet, G—three-jaw chuck.

Fig. 1. Therefore, to obtain a correct computation of horsepower, the water equivalent of the container, test specimen, and all the other parts which are immersed in water must be considered with the water in the container. The time of cutting is constant; it can be chosen to suit the particular test and made short enough to eliminate noticeable heating through agitation of the water and losses by radiation, conduction, and convec-

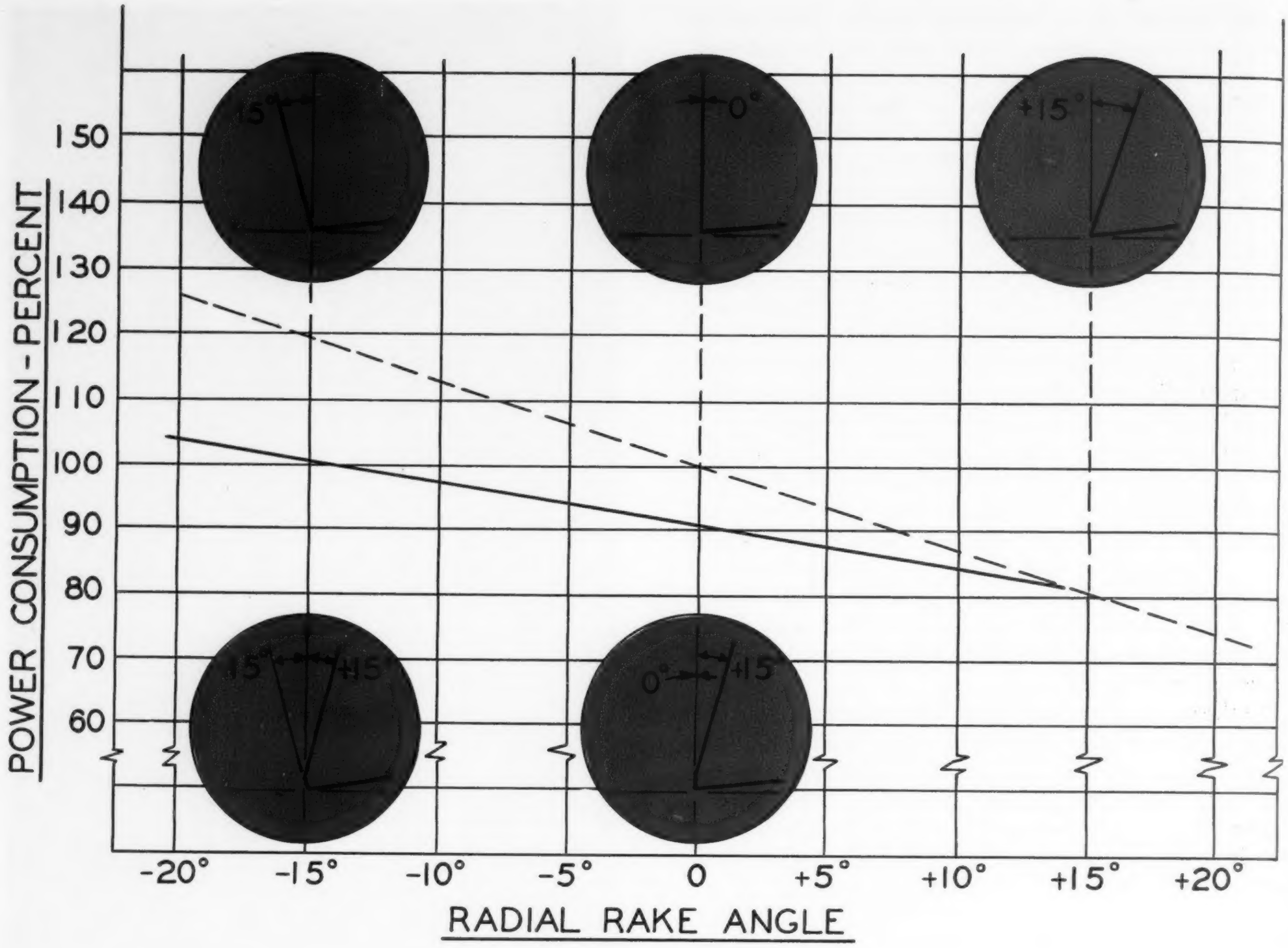

Fig. 2—Power consumption-radial rake angle chart showing variation in power consumption as the radial rake angle is varied in positive and negative directions. The broken line indicates power consumption of cutters with a single radial rake angle, while the solid line illustrates the lower power consumption of double radial rake angle CSM face milling cutters. The chart is based on the power consumption of a reasonably sharp cutter (high and low cutting speeds) with a zero degree radial rake angle as 100 per cent.

tion. To minimize the influence of the surrounding temperature, the water and all parts of the equipment should be at room temperature at the beginning of the experiment.

All the necessary values are therefore available for the determination of the horsepower required in the cutting of metals or other materials from the heat generated in the cutting operation. When a tubular test bar of smaller diameter than the drill is machined the friction and squeezing action at the chiseledge point and the margin which always occur in the drilling of holes are eliminated. The water has no effect on the cutting forces.

The main advantage of this testing method is that it shows even small differences in the machining properties of various metals and casting alloys. It is sensitive enough to bring out changes in machinability due to a different heat treatment or a variation in the alloy composition. Better machinability will be indicated by a lower calorimeter temperature.

In order to measure the heat generated during the cutting operation as accurately as possible, the use of 50 cc of water in these tests is expedient. With a larger volume of water, temperature rise values will be smaller. This makes the differences in thermometer readings less pronounced and also necessitates the use of a correspondingly larger agitator.

The accuracy of this type of calorimeter can be checked by mounting the apparatus on a dynamometer registering torque and thrust simultaneously. Power values obtained with either device in this setup are in close agreement, within 1 to 3 per cent. Various metals can be machined at different feeds and speeds. Since the individual tests are of only a few seconds duration, no corrections for heat losses need be made because these losses are too small to influence results to any appreciable degree.

Differences in the cutting properties of metals require different tool forces, and there different amounts of heat are generated. The better the cutting properties of a metal, the less heat will be generated during the machining operation.

Sample Computation—The water equivalent of the calorimeter in Fig. 1 was computed as 20.00 g when cutting gray cast iron.

When cutting a brass test bar the water equivalent is 19.75 g. When cutting a magnesium test bar the water equivalent is 18.46 g.

The drill runs at 510 rpm; feed 0.004 in. per revolution. The length of the test bar being cut is 1 in.

Cubic inches of metal cut per minute = 0.2059
Water equivalent of container, etc. = 20.00 g
Water = 50.00 g
Total water equivalent = 70.00 g

$$\text{or } \frac{70.00}{453.6} = 0.1543 \text{ lb.}$$

Temperature rise of calorimeter = 16 F

$$\text{Time of cutting} = \frac{1 \times 250}{510} = 0.491 \text{ min}$$

$$0.1543 \times 16 = 2.469 \text{ Btu per } 0.491 \text{ min}$$

$$\frac{2.469}{0.491} = 5.029 \text{ Btu per min}$$

$$1 \text{ hp} = 42.44 \text{ Btu per min}$$

$$\text{Horsepower from heat} = \frac{5.029}{42.44} = 0.1185$$

Horsepower per cubic inch of metal cut per minute

$$\frac{0.1185}{0.2059} = 0.5755$$

In comparison to the foregoing values obtained with gray cast iron, the temperature rise of the calorimeter when machining an equivalent volume of free cutting brass is 10 F, which indicates 0.35 horsepower per cubic inch of brass cut per minute. In cutting the same volume of steel, SAE 1030, the temperature rise of the calorimeter is 28 F, and the corresponding horsepower per cubic inch is 0.98, showing a 70 per cent increase in the power required to cut steel under conditions otherwise identical with those in cutting gray cast iron.

Machining of a high carbon tool steel showed a calorimeter temperature rise of 50 F. Those materials which give a high calorimeter temperature rise can be tested by cutting only ¼ or ½ in. of the test bar and using the proper values in the computations.

In many cases it is unnecessary to measure the machinability with such accuracy since numerous casting materials machine very easily. Almost all machines have ample power for cutting aluminum and magnesium alloys; machinability in this case involves questions of tool life and surface finish.

When an investigation of high-speed milling was initiated by the company with which the author is associated, a calorimetric method was chosen as the means for obtaining cutter power data. The calorimetric method eliminated discrepancies which are caused by varying drive motor efficiency, lubrication and friction factors in gears and bearings.

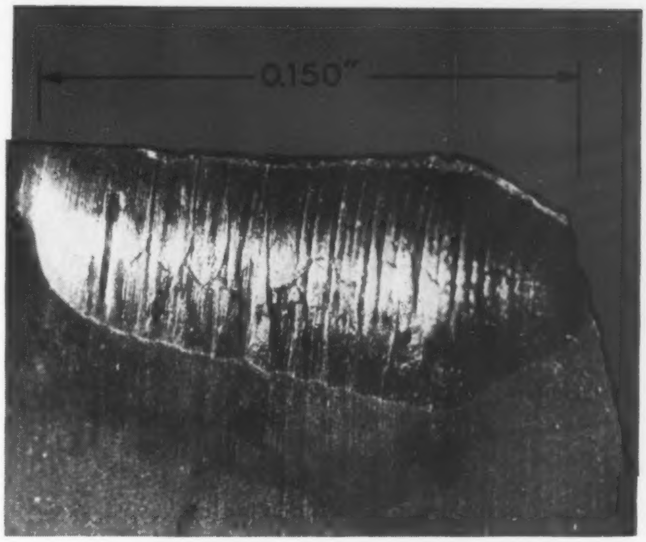

Fig. 4—Cemented carbide tip after machining steel at 2140 fpm cutting speed. Depth of cut, 0.150 in., chip thickness, 0.010 in.

The apparatus made possible the acquisition of data with which the interrelationship of cutting speeds, feeds, tool angles, and workpiece material could be further determined. The effect of the various radial rake angles on the tool forces when milling steel was thoroughly checked at low as well as at high cutting speeds, and Fig. 2 is a graphical representation of the results.

A cutter with a 15- or 30-degree positive secondary radial rake angle at the cutting edge, with a negative primary radial rake angle 1 to 2 times the width of feed

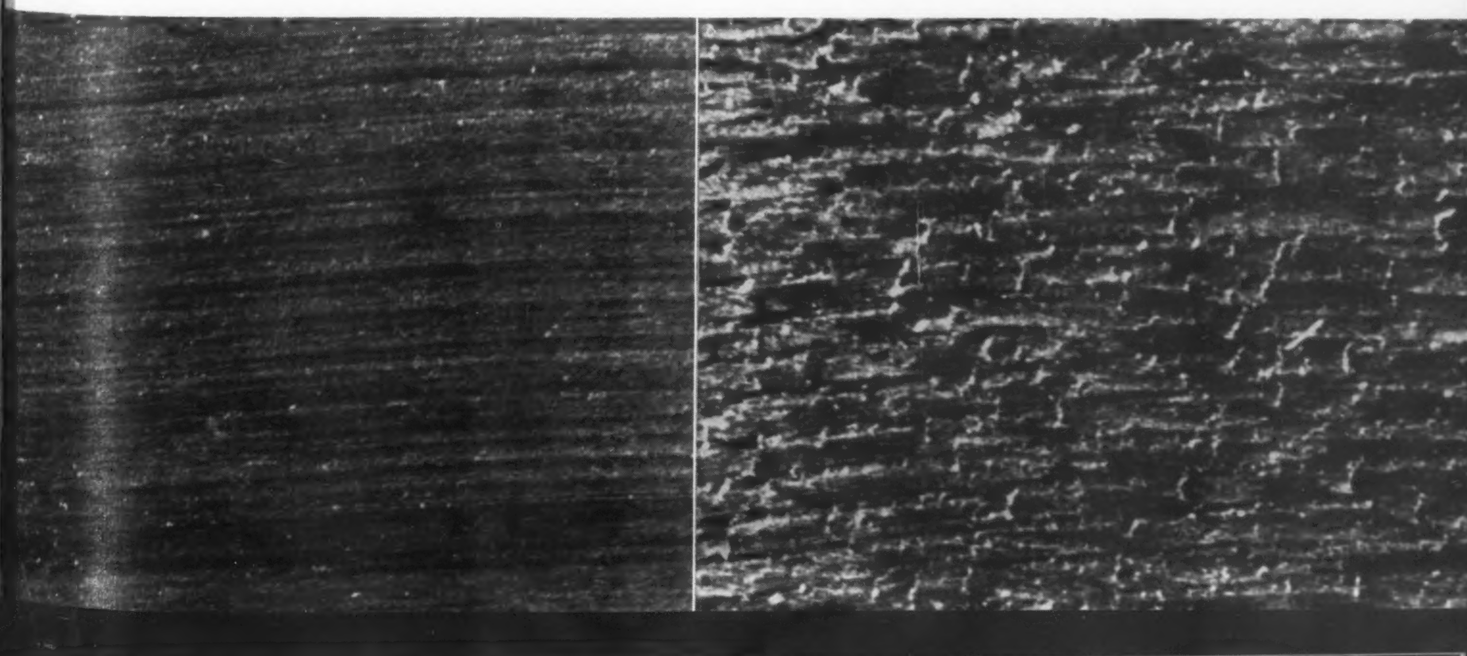

Fig. 3—Surface finish as obtained in milling steel at different cutting speeds. Left—photograph at 572 fpm; right, 115 fpm. Both pictures taken at the same magnification. On the left and right sides the traces left by the profilometer head can be seen. The length of these marks is 0.120 in. Profilometer readings for the surface at right, 160; at left, 30 microinches (rms).

Fig. 5—Modern 8-in. milling cutter for machining light metals and mild steel.

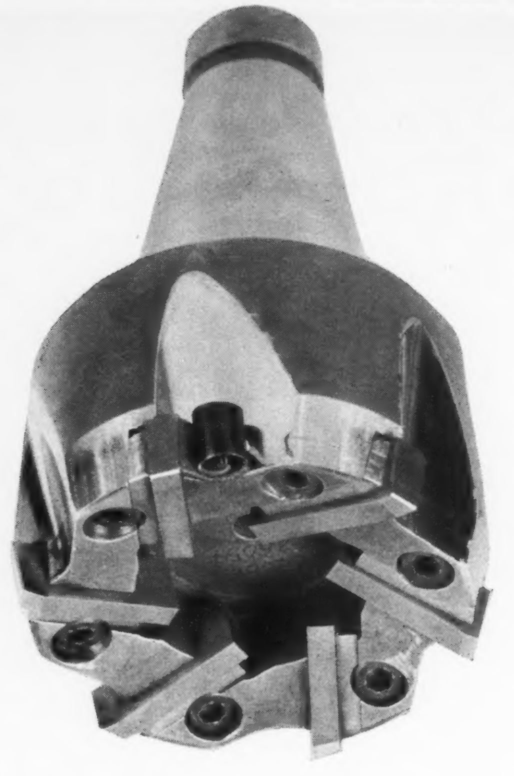

Fig. 6—Modern 4-in. milling cutter for machining steel and non-ferrous metals.

per tooth, was found to be most effective since it combined the increased strength of the cutting edge afforded by negative radial rake angles with the lower power requirement of the cutter with positive radial rake angles.

Determining Tool Life

While reliable procedures and data have been established for the determination of tool life in machining steel with single-point tools, the same methods cannot be used for non-ferrous metals. Steel exerts a very high pressure on a tool with attendant high cutting temperatures and abrasive action. Because of large tool forces in this operation the work done, or the heat generated, during the cut is much higher than that for cutting light metals. Therefore, complete failure of the cutting tip in a tool-life test on a steel workpiece can be obtained with high cutting speeds in a few minutes. Light alloys machine easily with the result that the tools stand up much longer and a tool-life test to complete breakdown would consume excessive time and material.

Cemented carbide tools stand up longer than high-speed steel tools, but high cutting speeds will cause rapid tool wear. For aluminum and magnesium alloys cutting speeds up to 18,000 fpm have been recommended. In many instances, these recommendations are based on a belief that definite advantages can be realized from extremely high cutting speeds.

One of the primary factors in determining cutting speeds for metal cutting is the power available at the machine spindle. A second factor which must be considered is the type of cut to be taken, i.e., either roughing or finishing.

Effect of Cutting Speeds

Figure 3 shows photomicrographs of surface finishes obtained when milling steel at two different cutting speeds with the same cutter under otherwise identical conditions. The picture (left) shows the improvement through use of higher cutting speed. However, cutting speeds above 800 fpm are not to be generally recommended for carbide steel milling, because tool wear becomes too pronounced.

Figure 4 shows a magnified view of a carbide cutting edge which had machined 10.4 cu. in. of mild steel at 2140 fpm. The crater is 0.040 in. deep. The same tip could machine 100 cu. in. of the same material at 400 fpm and would show only minute wear. Economical feeds and speeds for milling with sintered carbide are listed in Table 1.

As the cutting speed is increased, wear at the cutting edge of the tool becomes more pronounced. Test procedures have been employed in which the amount of flank wear on a single-point tool is measured and used in the determination of tool life when machining light metals. It is this gradual increase of wear on the tool which must be carefully watched. Even though it is not enough to prevent the tool from cutting, it does affect dimensions and surface finish.

When a coolant can be used, longer tool life, better surface finish and dimensional accuracy will result. Machining operations in which much friction is generated, such as drilling and tapping, are improved by a cutting fluid with anti-friction properties.

Rake and Clearance Angles

Tools generally used for machining light alloys employ different rake and clearance angles than those recommended for machining steel. In most cases they resemble woodworking tools, because the majority of light alloys can be cut with ease since they have a low modulus of elasticity, small impact strength, and chips separate easily from the workpiece. Therefore tools have larger rake and clearance angles.

Special care must be taken to provide unhampered chip flow. The tools should have keen cutting edges and the tool surface in contact with the chips should be

polished. For carbon and high-speed steel tools complete chromium plating is often beneficial. For long runs and high accuracy, carbide or diamond tipped tools are recommended.

A general distinction should be made between a roughing and a finishing operation in machining. In roughing, the object is to remove as much material as possible in the shortest time. This can be done best with the heaviest feed and depth of cut the setup will permit. In a finishing operation a good surface finish is desired and this can be obtained primarily with a fine cut, especially a fine feed at the highest cutting speed compatible with the capacity of the machine tool.

Blade Arrangement

Figure 5 shows an 8-in. milling cutter which is especially suitable for machining light alloys but has also been used successfully for cutting mild steel and monel. The blades are set at a 30 degree positive rake angle and are provided at the cutting edge with either a small negative radial rake angle for machining steel or a 6 degree positive radial rake angle for machining aluminum. This blade arrangement decreases the power required during the cutting operation. The wedge in back of the cemented carbide blade and the smooth flute in front permit free chip flow which is especially necessary in cutters used on light metals at high speeds and feeds.

How steel chips curl when the flute is designed properly is illustrated in Fig. 6. This 4-in. milling cutter can be used effectively on different materials whether they be high-strength steel or zinc die castings. In this cutter the blades of solid cemented carbide are set at a 15 degree positive radial rake angle. For use on cast steel a 6 degree negative radial rake face of small width is ground at the cutting edge which otherwise would crumble under the high pressure in steel cutting. For light metal the angle on the cutting edge can easily be ground to 6 degree positive (see B, Figure 7).

Fig. 7—Schematic diagram of milling cutter tooth with negative radial rake and positive secondary radial rake angle. (A) positive secondary radial rake angle, (B) negative primary radial rake angle, (C) peripheral clearance angle, (D) cutting edge, (E) inserted solid cemented carbide blade, (F) hardened wedge, (G) face mill body, (H) chip clearance surface.

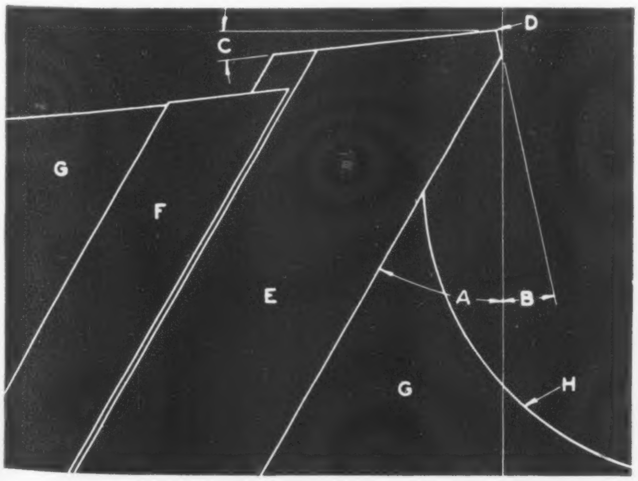

Fig. 8—Modern cutter for milling cast iron. This cutter of 8-in. diameter has 16 sintered carbide teeth, and is shown milling a diesel engine casting.

The space in front of each cutter is shaped for easy chip disposal and is also chromium plated. Each blade can be reset when worn too close to the cutter body and can be replaced when necessary. This particular type of cutter has seen extended shop use machining steel, manganese bronze, soft copper, monel, and aluminum alloys. Only the small face is changed for the different materials, as illustrated in (b) Fig. 7. The carbide tip is held by the wedge in the slot, even when comparatively short, and finally can be used in a single-point tool or brazed to a cutter body.

An 8-in. milling cutter with 16 carbide blades, Fig. 8, has been designed for high-powered milling machines. This cutter will permit a finer feed per tooth and thus a better surface finish at a high feed rate when milling cast iron. Since cast iron chips are usually short and not stringy, chip clearance in front of the tooth is not as important as in milling ductile materials.

Experience has shown that sintered carbides are sufficiently strong to cut cast iron and non-ferrous metals with positive rake angles. For shops with limited experience in carbide machining it would be well to start out by using single point carbide tools to gain experience. The next step might be milling of cast iron and non-ferrous metals. With a good background of this nature the more difficult jobs of milling cast steel and high strength alloys can be tackled successfully.

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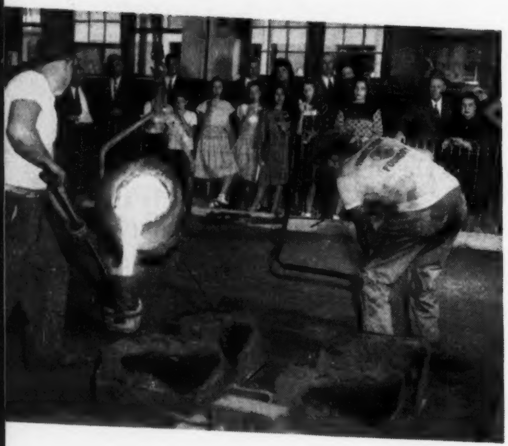
WELCOME 5,000 AT OPEN HOUSE



HAMILTON FOUNDRY & Machine Co., Hamilton, Ohio, entertained over 5500 people Saturday and Sunday afternoon, October 11-12, by holding an "open house" for employes, families and friends. Opening its doors for the first time since 1938, the workers carried on actual foundry operations and numerous special demonstrations for their guests during the two afternoons.

This event attracted 719 persons Saturday and 5,208 on Sunday; making a total registration figure of 5,927.

The conducted tours, complete with special guides in each area, were routed through all departments of the plant, including the physical testing laboratory where the breaking of test bars in the 30-ton tensile testing machine was done by a member of the "lab" staff.

After viewing the No. 1 pattern storage room, where more than 14,000 patterns are housed, the guests were shown a casting display from blueprint stage to finished product. On a long table were progressively shown the blueprint, master pattern, working patterns, sand and equipment used to make the molds, cope and drag sections of the mold, assembled mold ready for pouring, a poured mold, a mold dumped, an uncleaned casting, casting after cleaning and a finished casting. Then followed a demonstration of a two-man rollover molding machine as well as a squeezer molding machine; which attracted interest.

The visitors were shown in the coreroom, the making of cores with a rollover unit, preparing the core sand, core blowing and baking cores in a 36 ft. tower-type core oven.

Floor molding was explained in No. 2 foundry with the mechanical shakeout being demonstrated.

Prior to seeing the melting and pouring operations, an explanation was given on the cupola melting process by the engineering department. A special exhibit was set up by the department with a large diagram of the cupola and a display of all the ingredients that go to make up a cupola charge. The melting process was explained in detail by the aid of the large chart.

Top—Registration of guests as they entered the Hamilton Foundry. Center—Filling a hand ladle for one of the molders in No. 3 foundry. Bottom—Making cores on the rollover unit.

Guests await their turn to register.

In No. 3 foundry ten molders were making molds and pouring off molds as the iron was received from the cupola. A wire fence was constructed along the entire side of the foundry so that visitors were perfectly safe and yet could see the cupola being tapped and the metal poured. A loud speaking system was installed and a lecturer kept the crowd posted on all activities.

The last stage of the tour included inspecting the pattern department, carpenter shop and cleaning rooms.

Early on the tour, the plant distributed more than 9,000 ice cream bars to the visitors and the cafeteria continued to dispense hospitality by the serving of thousands of doughnuts, gallons of coffee, soft drinks, candy and more ice cream.

A safety and hygiene exhibit was arranged in the exhibit hall by Dr. Garret Boone, plant physician. Special displays of safety equipment, safety literature and exhibits of the Industrial Commission of the State of Ohio and Prudential Insurance Co. of America attracted much attention. In addition to the many

Crowd watching operator using a rollover molding machine.

booklets and free literature distributed among the guests, the foundry supplied special postcards for the visitors to mail to friends. Foundry officials reported over 3,000 cards were addressed during the affair.

Finished products which incorporate Hamilton castings were on exhibition, and in the exhibit of employees' activities were photographs of the company's softball and basketball teams, the annual Christmas party, service pin dinners and fire brigade. A number of trophies were on display depicting the success of the foundry's athletes.

Castings made during wartime were displayed, and the four-starred Army-Navy "E" flag was on exhibit, representing the enviable record of the plant during World War II. Some of the castings shown included a submarine diesel engine block, transmission case for Army trucks, sound detector body for under-water craft, crankshaft, and many others.

Souvenirs in the form of small cast iron dogs and bottle openers were distributed to the guests.

An interested group receiving instructions on pattern shop practice.

A group of students from Ohio State University, Columbus, were in attendance; they were with Prof. D. C. Williams, department of industrial engineering. Mr. Williams was formerly with Cornell University, Ithaca, N. Y., as A.F.A. Research Fellow, Foundry Sand Project.

Twin City Elects First Lady Officer

WITH THE recent retirement of Alexis Caswell, secretary-treasurer, A.F.A. Twin City chapter, Lillian K. Polzin was elected to succeed him in office. Thus Miss Polzin becomes the first lady secretary of an A.F.A. chapter, although Charlotte L. Gorney, Detroit, was appointed general assistant secretary of the general convention committee last year.

Miss Polzin joined the Manufacturers' Association, Minneapolis, in in 1923. Appointed Mr. Caswell's

Lillian K. Polzin

secretary a few years later, she became his "right hand." Miss Polzin attended a majority of the various technical society meetings, with Mr. Caswell and became widely acquainted with the members of the numerous technical society groups functioning in the area.

Prepare Petition For Albany A.F.A. Chapter

PETITION FOR the formation of the 39th A.F.A. chapter, the Eastern New York chapter with headquarters in Albany, is expected to be ready for consideration when the National Board of Directors convene in Chicago, November 3. A highly enthusiastic "expectancy meeting" was held October 14 in Albany with over 40 members and guests present along with a number of National officers.

Prior to this meeting a group of A.F.A.-minded individuals met September 8 and formed a steering committee composed of Charles E. Killmer, Swan-Finch Oil Corp., Albany, *Chairman;* Robert MacArthur, *Secretary;* and Arthur C. Hintz, Hines Flask Co., Troy, as third committee member.

Among the guests at the October meeting were: A.F.A. National Vice-President W. B. Wallis, Pittsburgh Lectromelt Furnace Corp., Pittsburgh, Pa.; National Director John M. Robb, Jr., Hickman, Williams & Co., Philadelphia; A.F.A. Technical Director S. C. Massari, Chicago; Metropolitan Chapter Secretary J. Fred Bauer, Hickman, Williams & Co., New York; and Metropolitan Chapter Director B. E. Beldin, Whitehead Bros. Co., New York.

SIDE-BLOWN CONVERTER
Producing Carbon and Alloy Steels

F. Cousans
Hadfields, Limited
Sheffield, England

THE PAST FEW YEARS HAVE WITNESSED a marked revival of interest in the side-blown converter method of steel making, and much research and development work has been carried out. In the years just prior to the war, steel founders in the United Kingdom were able to give special attention to the equipment of their foundries. Several steel foundries replaced their old side-blown converters with better plants of modern design and construction, and thought was given to possible improvements in operating technique.

Little reliable information on the side-blown converter process was to be found in the technical press, and, in consequence, a fresh approach was made. A serious shortage of hematite pig iron and the necessity for the utmost economy in the use of imported ferrosilicon during the war stimulated more general interest by all converter users in the possible improvements and economies in operation. The use of the immersion pyrometer for the determination of the bath temperature of liquid steel has proved to be of great assistance in the recent development work.

Molten Metal for Subsequent Conversion

Hot molten metal of regular chemical composition is essential for the successful production of steel by the side-blown converter process. The cupola is the normal melting unit employed, and in a general way the melting practice calls for little comment. The cupola charge normally consists of hematite pig iron and steel scrap. A scrap content of 60 per cent was, until recently, looked upon as a good figure, but now figures of 80 or even 100 per cent (where the plant is suitable) are being obtained.

Where high scrap charges are used, it is desirable to deepen the well of the cupola in order that metal of an adequate carbon content be obtained; the need for a high carbon content will be explained later. Higher sulphurs may result from a deepening of the well, but this can be remedied by desulphurizing by the sodium carbonate process.

Double desulphurizing reduces the sulphur content to very low limits, and figures of 0.010 to 0.015 per cent have been obtained in this way. The normal silicon of cupola melted metal for converter use is approximately 1.5 per cent, but recent research has demonstrated that a much lower figure can be worked to with satisfactory results.

For many years P. C. Fassotte (who is well known among American and British steel founders) has stressed the importance of carbon in obtaining a satisfactory temperature increment during conversion of metal into steel in the side-blown Bessemer process, and during the last war important plants were laid down in Great Britain which made use of this important function of carbon.

Steel scrap charges were melted in cupolas, and the extremely low-silicon molten metal after desulphurization was transferred to pulverized-coal-fired rotary furnaces. The metal was superheated to approximately 1,500 C, and was then transferred to side-blown converters. The resultant blows gave satisfactory temperature increments and the steel produced was of high quality and fluidity, and was suitable for the mass production of light, thin walled steel castings.

In the orthodox operation, molten metal at a temperature of 1,250 to 1,350 C, containing approximate percentages of C, 3.00 to 3.50; Si, 1.50; Mn, 0.50, is used in the converter. The oxygen of the blast, which impinges on the surface of the metal, reacts with the metal according to the laws (a) mass and (b) chemical affinity. As soon as the blast is put on, heavy brown fumes of iron oxide are seen leaving the mouth of the converter along with metal projections.

Conversion Process

Iron oxide formed on the surface of metal then reacts with silicon, manganese and carbon according to their relative chemical affinities at the temperature prevailing. The slag which is first formed is high in iron oxide, but it becomes increasingly silicious as the blow proceeds, and the iron oxide (FeO) in the slag at the end of the blow is generally within the range 20 to 25 per cent. The normal blow lasts 15 to 18 min.

In the case of the Fassotte operation, which only lasts 9 to 12 min, the molten metal at a temperature of 1,450 to 1,500 C and containing C, 3.00, Si, 2.4, Mn, 0.50 per cent, reacts immediately with the oxygen of the blast, forming excess iron oxide which escapes as fume, the remainder reacting immediately with the carbon. The small percentage of silicon present is insufficient to provide silicon to form a slag, and unless precautions are taken the free iron oxide rapidly attacks the converter lining materials. Silica sand thrown on the surface of the metal prior to putting on the blast provides the free iron oxide with silica with which to combine.

The temperature increment obtained from a normal blow (1.5 per cent silicon metal) generally is 350 to 450 C, whereas in the case of the low-silicon iron it generally averages 200 C. It is obvious that the modified blowing procedure using superheated low-silicon

NOTE: Official exchange paper to the American Foundrymen's Association from The Institute of British Foundrymen, 1947.

metal is more economical owing to the saving in silicon, in the duration of the blows and in lower chemical and mechanical losses. For plant reasons many founders are unable to take advantage of these potential savings, but it has been found possible even when using ordinary cupola melted metal to work with lower silicons in the metal than are generally used and still produce hot fluid steel of high quality.

In the case of cupola melted metal poured to and in the converter at a temperature of 1,250 to 1,350 C, it would appear that the function of the silicon is that of a kindling agent, the heat produced by its oxidation raises the bath temperature to that at which the carbon reaction commences. It therefore needs to be determined what percentage of silicon is essential to give the temperature increment necessary to allow the carbon reactions to proceed. The results of the following experiment may be of assistance in this connection.

A blow of 48 cwt was stopped after 8 min and the changes in the chemical composition and temperature were noted. The heat was poured into a ladle and allowed to cool to 1,460 C. The metal, after a slagging, was poured back into the vessel and the blow recommenced. The bath lit off immediately, blew steadily and finished in a normal manner. The heat was slagged, the ferro alloys were added and the steel cast quite satisfactorily from a stoppered ladle. The chemical changes are shown in Table 1.

Temperature Increment

It will be seen that in general terms and under the conditions of the experiment, the oxidation of 0.90 per cent silicon, etc., gave an initial temperature increment of 190 to 200 C, and from 2.50 per cent carbon a further increment of 180 C was obtained. The reason why the qualification "under the conditions of the experiment" has been made is that the test was made in a plant where the volume of air per minute to the converter was less than that generally used.

It was found possible to check over these results in a different plant and in a modified form. A series of heats was blown in an acid-lined side-blown converter and the metal and temperature changes were noted. A fresh series was blown for 3 min, and the original metal composition and temperature together with slag and metal compositions and bath temperature after the 3-min blow were noted. A further series was blown for 6 min and similar data obtained. A series of 9 and 12 min and end of blow determinations were also made. A study of the data obtained reveals the general information shown in Table 2.

It will be noted that the rate of temperature change is highest during the second 3 min of the blows, and thereafter tends to fall off rather sharply. The rate of oxidation of silicon is reasonably uniform over the first 6 min, whereas the rate of oxidation of carbon is highest at about 9 min of blowing. Heats of metal of the chemical composition and weight given above generally finish in approximately 15 min blowing time, and during the blows a temperature increment of 360 to 370 C is obtained.

A study of the foregoing results again demonstrates the economy in the use of silicon and of reduction in blowing time that can be effected if cupola metal of high initial temperature be used, and the results also demonstrate that lower silicons in the bath than are generally used can give good temperature increments.

It should be the aim of side-blown converter users to bring down metal in the cupola of standard chemical composition and of as high a temperature as possible. If the metal temperature be determined by means of an immersion pyrometer it should be possible, knowing the chemical composition of the metal, to predict the final bath temperature at the completion of the blow.

This makes possible the production of standard temperature steel by the side-blown converter process. If it should be necessary to obtain temperature increments higher than normal, controlled additions of ferrosilicon (based on metal composition and weight) can be made during the correct part of the blow, or by addition to the bath prior to putting on the blast.

During the past few years efforts have been made to use photoelectric cell control units to determine the end point of heats made by the side-blown converter process.[2] The quality of product made by the process

TABLE 1—CHEMICAL CHANGES IN EXPERIMENTAL BLOW

	Elements, per cent				
	C	Si	S	P	Mn
Metal in vessel	3.16	1.03	0.034	0.033	0.43
Metal after 8-min blow	2.56	0.14	0.033	0.035	0.14
Losses	0.60	0.89	——	——	0.29
	(Increase in temperature, 195C)				
Metal poured to vessel and blow recommenced	2.56	0.14	0.033	0.035	0.14
End of blow 3 min later	0.08	0.05	——	——	0.04
Losses	2.48	0.09	——	——	0.10
	(Increase in temperature, 180C)				

TABLE 2—SECOND EXPERIMENT

Weight of metal blown: 45 cwt (approx.)
Initial composition of metal blown: C, 3.00 to 3.20; Si, 0.70 to 0.90; Mn, 0.40 to 0.60.
Temperature of bath, 1,240 to 1,280 C

After 3 min blowing: 2,500 cu ft free air per min (approx.)
Composition of metal: C, 3.00 to 3.30; Si, 0.35 to 0.40; Mn, 0.25 to 0.30.
Composition of slag: SiO_2, 37 to 47; FeO, 40 to 45, MnO, 9 to 12 per cent.
Temperature increment: 80 to 105 C

After 6 min blowing: 2,000 cu ft free air per min (approx.)
Composition of metal: C, 2.60 to 2.70; Si, 0.10 to 0.15; Mn, 0.07 to 0.10 per cent
Composition of slag; SiO_2, 35 to 40 per cent; FeO 42 to 46 per cent; MnO, 9 to 11 per cent
Temperature increment: 250 to 260 C

After 9 min blowing: 2,500 cu ft of free air per min (approx.)
Composition of metal: C, 1.50 to 1.70; Si, 0.05 to 0.10; Mn, 0.04 to 0.08 per cent
Composition of slag: SiO_2, 50 to 55; FeO, 30 to 35; MnO, 10 to 11 per cent
Temperature increment: 275 to 305 C

After 12 min blowing: 2,000 cu ft of free air per min
Composition of metal: C, 1.15 to 1.35; Si, 0.05 to 0.10; Mn, 0.03 to 0.08 per cent
Composition of slag: SiO_2 54 to 58; FeO, 26 to 30; MnO, 9 to 11 per cent
Temperature increment: 315 to 330 C

Table 3—Composition and Inclusion Counts of the Converter Steel

	1	2	3	4	5	6	7	8
Chemical Analyses, per cent								
C	0.225	0.20	0.21	0.20	0.20	0.20	0.215	0.20
Si	0.37	0.33	0.38	0.34	0.38	0.35	0.38	0.36
Mn	0.94	0.86	0.90	0.85	0.99	0.86	0.82	0.85
S	0.036	0.033	0.035	0.042	0.029	0.037	0.034	0.028
P	0.043	0.045	0.042	0.042	0.042	0.051	0.040	0.041
Inclusion Counts (Fox Method):								
	88	78	72	87	67	85	77	75

depends broadly upon two factors—the working temperature and the skill of the operator in turning heats down at the proper time.

If heats be turned down too early incorrect carbon results may be obtained, and if too late excessive losses of ferro alloys occur during deoxidation. A series of heats was blown and the end point of the heats was determined by a photoelectric cell with a series of filters. A statistical study of the carbons in the blown metals was made, and it can be stated that the use of photoelectric cell control offers distinct possibilities of success in giving uniform chemical composition in the bath at the end of the blow. The British Iron and Steel Research Association has a comprehensive program of work in hand in this connection.

There are also indications of a relationship between the bath temperature and the intensity of the flame. It has been found necessary in connection with this investigation to maintain a close control over the size of the vessel mouth, and within the range of bath temperature of 1,640 to 1,700 C (immersion readings) the cell fitted with a red filter has given deflection readings of 2.1 to 3.1, and on plotting the results almost a straight line relationship has been noted. The work should be continued with a complete range of filters and it is hoped, in due course, to submit further details of the results.

Degree of Control

The side-blown converter process is capable of producing regularly steel heats of uniform chemical composition, temperature and fluidity. Statistical studies of the chemical analysis of steel made by this process have demonstrated that, as far as carbon content is concerned, it is possible to obtain as uniform results as those of any other steelmaking process.

Figures for silicon and manganese are not as good unless the slag formed as the result of the conversion operation is removed before the alloys are added. It is realized that the slagging operation is an additional one, but, bearing in mind the economy in the use of ferro alloys for deoxidation when this is done, the extra work is fully justified.

Heats of steel which have been so handled reveal close control over silicon and manganese contents in the finished product. It is, of course, essential to weigh all metal prior to charging to the converter, and it is desirable to weigh all liquid steel produced. This gives a clear picture of blowing losses, and in this connection losses of from 7.0 to 8.0 per cent are being obtained regularly. In considering this problem of losses it is necessary to consider the causes, (a) chemical and (b) mechanical. With cupola metal of C, 3.0, Si, 0.8 and Mn, 0.5 per cent, there is a chemical loss of 4.3 per cent without taking losses of iron due to oxidation into account.

If hot metal be used the use of low-silicon iron helps reduce the chemical losses to a minimum. The design of the converter has an important bearing upon the problem of mechanical losses. Experience has shown that a long converter body with a small mouth helps to keep the mechanical losses at a low figure.

Some of the metal which might be projected from the converter as the result of the impingement of the blast upon the metal surface falls back into the vessel if a small mouth be used. In blowing low-silicon irons it has been found advantageous to add silica sand on the metal surface prior to putting on the blast, to protect the vessel lining against the attack of iron oxide, etc. This point has been mentioned earlier, but in view of its value it is again stressed.

The quality of steel made by the acid side-blown converter can be much higher than is generally appreciated. The possible regularity and uniformity of chemical composition has already been mentioned. The cleanliness and low gas contents are other factors which ought to be stressed. Eight heats of steel show the chemical analyses and inclusion counts set out in Table 3.

The analyses (Table 4) of samples taken during a heat of steel will support the claim that the steel com-

Table 4—Gas Analyses of Converter Steel

Cupola metal before desulphurizing, per cent				
C	2.99	2.94		
Si	1.08	1.05		
Mn	0.67	0.68		
S	0.084	0.090		Temperature of metal, 1,340 C by the immersion pyrometer
P	0.043	0.042		
O	0.006	0.014		
H	0.0002	0.0006		
N	0.009	0.008		
Cupola metal after desulphurizing, per cent				
C	3.13	3.08		
Si	0.82	0.81		
Mn	0.61	0.61		
S	0.057	0.041		Temperature of metal, 1,267 C by the immersion pyrometer
P	0.042	0.042		
O	0.0025	0.003		
N	0.004	0.004		
H	0.00005	0.00005		
Blown metal, per cent				
C	0.08	0.07		
Si	0.03	0.04		
Mn	0.12	0.08		
S	0.037	0.041		Temperature of blown, 1,682 C by the immersion pyrometer
P	0.039	0.042		
O	0.035	0.050		
H	0.0007	0.0007		
N	0.010	0.009		
Final steel, per cent				
C	0.25	0.24	0.24	
Si	0.36	0.36	0.36	
Mn	1.52	1.52	1.52	Temperature of steel in ladle, 1,562 C by the immersion pyrometer
S	0.047	0.044	0.047	
P	0.048	0.047	0.053	
O	0.0025	0.0025	0.0025	
H	0.00015	0.00015	0.00015	
N	0.005	0.005	0.005	

pares favorably with that made by other processes as far as gas content is concerned, and will be of interest as indicating the changes in gas content which occur during the conversion process.

Physical and Mechanical Properties

The side-blown converter process is ideal for the production of carbon steels of any carbon content. Liquid cupola metal can be used to recarburize heats requiring a high carbon content in the final steel. Low-carbon steel produced by this process for high permeability properties gave the results shown in Table 5.

For many general engineering purposes steel castings possessing a tensile strength of approximately 30 tons per sq. in. are preferred, and large quantities of this quality are produced in Great Britain by the acid side-blown converter process. The properties shown in Table 6 are obtained from this class of material.

The 1 x 3/4-in. bend tests gave a 120 degree bend without fracture. The results obtained on a Wohler machine were: Tested at ± 15.0 tons per sq in., unbroken at 11,740,380 revs.; tested at ± 16.0 tons per sq. in., broken at 1,979,460 revs. Short-time tests at elevated temperatures gave the figures shown in Table 7.

TABLE 5—PROPERTIES OF CONVERTER STEEL

Chemical analysis: C, 0.10; Si, 0.18; Mn, 0.34; S, 0.045; and P, 0.034 per cent

Mechanical properties: Yield point, 12.5 tons per sq. in.; maximum stress, 22.7 tons per sq. in.; elongation, 37 per cent; reduction of area, 57 per cent

Magnetic properties

H Values: 5, 10, 20, 40, 50, 60, 100, 150, 200

B Values: 10,900, 13,650, 15,300, 16,500, 16,850, 17,100, 18,100, 19,000, 19,600.

Some makers prefer the composition: C, 0.25, Si, 0.30, Mn, 1.50 per cent for service conditions requiring resistance to wear and abrasion, while others use C, 0.40, Si, 0.30, Mn, 0.80. Both of these steels are regularly made by the side-blown converter process, and the values shown in Table 8 give an indication of the properties obtained from such steels.

The 0.40 per cent carbon type of steel is suitable for gears surface hardened by the "Shorter" process, and many castings of this type are made annually by the converter process. Typical test results, using the Vickers hardness machine, gave surface hardness of 700 to 750, while sections showed the total depth affected to be 0.128 in., the depth of martensite being 0.076 in. while that of troostite was 0.052 in.

TABLE 6—PROPERTIES OF 30-TON CONVERTER STEEL

Chemical analysis: C, 0.21; Si, 0.28; Mn, 0.90; S, 0.033; and P, 0.037 per cent

Yield Point, tons/sq. in.	Max. Stress, tons/sq. in.	Elongation, per cent in 2 in.	Reduction of Area, per cent
17.40	30.12	33	57
15.12	30.00	32	52
15.32	30.00	32	57
15.64	30.60	33	59
17.60	31.00	33	57
16.72	30.92	32	54
17.20	30.80	33	54
15.72	31.24	33	57

The fluidity of the two steels when made by the side-blown converter process with the proper degree of temperature control is excellent, and the steels are well suited for the production of light, thin-walled castings. Other general types of carbon steels made by the same process include 0.60 per cent carbon, and 0.4 carbon and 1.5 per cent manganese steels.

Alloy Steels

Nickel and molybdenum steels can be made easily by this process, the alloys (nickel and ferromolybdenum) being added to the metal before the blow commences. In the case of chrome and vanadium steels, the alloys are added to the bath after slagging and after deoxidation. Austenitic manganese steel can be made by adding molten ferromanganese to the bath of killed carbon steel, any adjustments required to keep the carbon-manganese ratio being made with low-carbon ferromanganese. The following physical properties of low alloy content and of austenitic manganese steel castings made by the side-blown converter are given to indicate the quality of the product.

TABLE 7—STRENGTH DATA AT ELEVATED TEMPERATURES

Tested at	300C	400C	450C
0.05 per cent press stress, tons per sq. in...	11.0	8.9	8.5
0.10 per cent proof stress, tons per sq. in..	11.35	9.6	9.3
Yield point, tons per sq. in..............	12.9	12.5	11.5
Maximum stress, tons per sq. in..........	34.6	29.6	25.0
Elongation, per cent.....................	30.0	35.0	36.0
Reduction of area, per cent.............	45.0	50.0	60.0

TABLE 8—COMPOSITION AND PROPERTIES OF LOW AND MEDIUM CARBON STEELS

Chemical Analysis: C, 0.24; Si, 0.26; Mn, 1.47; S, 0.037; and P, 0.037 per cent.

Yield Point, tons/sq. in.	Max. Stress, tons/sq. in.	Elongation, per cent in 2 in.	Reduction of Area, per cent
22.32	39.12	26	44
22.40	39.38	24	43
23.20	39.04	27	50
22.80	38.40	28	52

Chemical Analysis· C, 0.39; Si, 0.36; Mn, 0.84; S, 0.037; and P, 0.057 per cent.

23.08	42.08	19	24
24.20	39.52	22	28

Nickel Steel (3 Per Cent Nickel)

Chemical Analysis: C, 0.20, Si, 0.35, Mn, 0.80, Ni, 3.00, S, 0.035 and P, 0.040 per cent.

Mechanical Properties—Yield point, 24.0 tons; maximum stress, 36.4 tons; elongation, 27 per cent; reduction of area, 47 per cent. The fluidity of this steel is extremely high and it is well suited for running castings having thin sections.

Molybdenum Steels

Chemical Analysis: C, 0.22, Si, 0.35, Mn, 0.76, S, 0.037, P, 0.042, Mo, 0.64 per cent.

Tested at*	Room temperature	300C	400C	450C	500C	550C
Limit of proportionality	19.5	11	10	9	9	6.5
Yield point, tons/sq. in.	21.2–24.8	20.75	18	18	17.5	16.75
Maximum stress, tons/sq. in.	33.0–34.8	41.25	34.25	33.75	29.75	25.25
Elongation, per cent	30.0–31.5	14.5	24.75	31.75	34.5	36
Reduction of area, per cent	52–57	24	40.25	54.75	69	77.75

* Tests at elevated temperatures were short-time tensile tests.

Chrome-Molybdenum Steels

Chemical Analysis: C, 0.25, Si, 0.36, Mn, 0.96, S, 0.010, Cr, 1.05, Mo, 0.46 per cent.

Attention is drawn to the low sulphur content in this steel, the heat being doubly desulphurized. Original cupola metal, 0.068 per cent S; after first desulphurizing, 0.025 per cent S; and after second treatment, 0.014 per cent S.

Water Quench, °C	Temperature °C	Yield Point, tons/sq. in.	Max. Stress, tons/sq. in.	Elongation, per cent	Reduction of Area, per cent
900	450	49.52	72.72	9.5	33
900	500	43.72	66.76	13	36
900	550	43.64	62.56	15	47

Copper-Manganese-Molybdenum Steels

Chemical Analysis: C, 0.24, Si, 0.52, Mn, 1.44, S, 0.041, P, 0.045, Mo, 0.39, Cu, 0.62 per cent.

Water Quench, °C	Temperature °C	Yield Point, tons/sq. in.	Max. Stress, tons/sq. in.	Elongation, per cent	Reduction of Area, per cent
900	580	50.36(a)	57.52	14	30
900	650	36.04(b)	45.16	24	52

Impacts
(a) 40, 41, 41
(b) 49, 47, 55

This steel was used to produce castings 0.375 in. thick and little trouble was encountered due to short-run edges, etc., the steel being quite fluid.

Austenitic Manganese Steel

C, per cent	Si, per cent	Mn, per cent	S, per cent	P, per cent	Max. Stress, Tons/sq. in.	Elongation, per cent	Reduction of Area, per cent
1.02	0.82	13.75	0.020	0.068	59.3	64	38
1.02	1.09	13.10	0.020	0.069	58.06	52	41
1.16	0.78	13.75	0.020	0.076	58.38	59	43

Chemical Analysis: C, 1.20, Si, 0.83, Mn, 12.8, S, 0.020, P, 0.066, Cr, 1.28 per cent.

Maximum Stress, tons/sq. in.	Elongation, per cent	Reduction of Area, per cent
60.34	55.5	Unbroken
61.32	62	42
62.34	62	41

The addition of chromium to this steel slightly increases the hardness and reduces the tendency of the steel to "spread" or "flow" in service.

The foregoing figures are intended to demonstrate the excellent properties of the steel that can be made by this process. Statistical studies of the test results taken over a long period have shown that the properties of steels produced by the process compare favorably with those of steels of similar chemical analysis produced by any other process and used for steel casting production. From the steelfounder's point of view, the process is flexible and gives hot fluid steel in suitable quantities (depending, of course upon plant facilities) and at regular intervals.

This makes the process an ideal one for the mass production of green-sand steel castings, and it is the author's considered view that, with the aid of the new technical control methods and instruments, the process will regain its former popularity. The real test, of course, will be the quality of castings made, and their subsequent behavior in service.

Future Developments

Excellent figures for gas content which have been obtained and quoted in this paper, and confirmed by other workers, have convinced bulk steel producers of the possibilities in the side-blown operation. In Germany during the recent war, 25-ton basic side-blown converters were in use at the Mannesmann Works at Huckingen, and these proved very successful, steel being made to a regular specification of 0.008 per cent nitrogen. The steel made from the side-blown converter is hotter than that from the bottom-blown vessels.[4]

Liquid steel can be produced at as low a cost by the side-blown converter process in plants of modern construction and with the necessary degree of technical control as that by any other steelmaking process. It is, therefore, safe to predict a good future for the process, for the production of steel for castings and possibly for ingot production.

It is felt that development will follow (a) the increased use of superheated low-silicon metal, or at least a greatly increased tonnage of lower-silicon metal than is at present used; (b) more control over desulphurization and possibly of dephosphorization; (c) a general use of immersion pyrometer equipment as a means of accurate temperature control; (d) the use of photoelectric cell units for controlling the end point of the process and as an additional means of temperature control; (e) better converter design as a means of reducing metal losses due to projections, and (f) greater appreciation of the high quality of steel that can be produced by the process if proper precautions are taken.

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4. "German Iron and Steel Industry, Ruhr and Salzgitter Areas," Combined Intelligence Objectives Subcommittee, Item No. 21. File XXXII–119. H. M. Stationery Office.

APPOINT RESEARCH FELLOWS FOR THREE INVESTIGATIONS

The American Foundrymen's Association has appointed four men as research fellows and investigators to aid in the newly established research program the Association has undertaken. These men will work in close cooperation with the institution or committee which has cognizance over a specific investigation.

The first three committees to announce appointments were the Sand Research Committee, Cupola Research Committee and the Aluminum and Magnesium Research Committee. In the case of the two former, the sand and cupola committees, the work of these committees is continuing as they have been functioning for a number of years, however, the aluminum and magnesium group is comparatively new and just beginning.

John Parks Fraser, in the graduate school, Cornell University, Ithaca, N. Y., holds the A.F.A. Investigatorship for the Sand Research Committee. Robert H. Nagel, also a member of the graduate school, Cornell University, has been awarded the assistantship.

Mr. Fraser comes from Evanston, Ill., and received his Bachelor of Science degree in chemical engineer-

J. P. Fraser *R. H. Nagel*

ing from Cornell in 1947. He served in the navy during the war on an aircraft carrier.

Mr. Nagel was born in New York City and graduated from Rensselaer Polytechnic Institute, Rensselaer, N. Y., in 1944 with a Bachelor of Science in chemical engineering. In service, he was in the navy and manned an LST.

Thaddeus Giszczak, Detroit, has been appointed research metallurgist, Cupola Research Committee. He will conduct surveys pertaining to cupola operation, analyze reports, disseminate information and numerous other duties.

He is a graduate of Wayne University, Detroit, with a Bachelor of Science degree in chemical engineering, and is studying for his Masters degree. He has a wide range of experience including teaching, research and practical plant work. Holds memberships in American Chemical Society and ASM.

Roy E. Swift is a Yale-Battelle Research Fellow at Battelle Memorial Institute, Columbus, Ohio, investi-

T. Giszczak *R. E. Swift*

gating "The Mechanics of Fluid Flow in Molds as Affected by Mold Design" a project sponsored by the A.F.A. Aluminum and Magnesium Division.

Mr. Swift was born in Elgin, Ill., and has spent about a dozen years accumulating a broad and varied experience which includes, practical plant work, engineering instruction and research. He received a Bachelor of Science degree in mining engineering from Missouri School of Mines and Metallurgy, Rolla, in 1934. He later obtained Master of Science degree in mining engineering from University of Washington, Seattle, in 1940, and metallurgical engineering from University of Utah, Salt Lake City, in 1945. From 1946-47, Mr. Swift was at Yale University under an engineering scholarship.

He has been an instructor, New Haven YMCA Junior College, in charge of evening classes in physics and engineering materials and also an assistant professor of metallurgical engineering, Purdue University, Lafayette, Ind. At the University of Alaska, College, he was associate professor in chemistry and instructor in metallurgy. A member of several societies including AIME, ASM, and American Chemical Society.

A.F.A. Officials Meet With Munitions Board

Meeting with the Army and Navy Munitions Board on September 30 at the Bureau of Yards and Docks, Washington, D. C., members of the National Castings Council laid the ground work for foundry industry to obtain appropriate representation on the Advisory Committee of the Board.

The Council expressed its desire to assist in planning castings production should any national emergency occur. This, in a way, is the essence of the workings of the Council; providing a medium for cooperative action among the various organizations serving the foundry industry on matters of mutual interest.

Admiral Paine at the conclusion of the conference promised that the ANMB would recommend the appointment of a Foundry Advisory Committee as soon as the Board was able to assimilate an advisory group and had specific tasks for it to perform. At the present time due to limited personnel of the Board and the embryo nature of its present plans, it was felt that they had not yet reached the stage where such a committee could be utilized to advantage.

The meeting proved quite satisfactory and the Army and Navy Munitions Board representatives have a genuine appreciation of the importance and fundamental nature of the foundry industry in time of national emergency.

Representing A.F.A. at this meeting were National President Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va., and A.F.A. Technical Director S. C. Massari.

Chapter Leader Photos

A.F.A. Headquarters needs photographs of chapter officers and directors for use in American Foundryman. The cooperation of all newly elected officers and directors in sending photographs or a clear snapshot to the National Office without delay will be greatly appreciated. Thank you!

MANAGEMENT'S STAKE IN TRAINING FOREMEN

S. G. Garry
Caterpillar Tractor Co.
Peoria, Ill.

THE ABILITY OF ANY INDUSTRY to survive is measured by the extent to which it produces profits, without which capital will be withdrawn and materials, equipment and labor can not be purchased. A successful industry must produce goods which give satisfaction. Superlative advertising and sales effort alone are worthless—only a high-quality product efficiently produced will support a successful enterprise.

A successful industrial organization must be closely knit, must have internal unity of purpose and must be guided by intelligent leadership from the topmost executive to the foreman and his assistants. The importance of quality places the entire responsibility on the production division.

In the training and education of foremen, management has a stake of great import to industry. It is to the foreman that industry looks in seeking to control costs upon which profit and the successful continuance of the enterprise depend. It is upon the foreman's shoulders that the responsibility for quality and quantity efficiency rests, for it is under his direct supervision that the work of production is done. It is the foreman who must instill standards of quality workmanship into the habits of his men.

Foremen are in an excellent position to help their men to think straight. Lack of understanding is one of the greatest causes of industrial controversies. A sane and intelligent point of view on vital questions can develop efficiency, satisfaction and contentment in the workers and thus insure a smooth, steady output.

Cost Classification

There are three classifications of cost in industry:

1. Direct and indirect labor costs: 2. Direct material costs: 3. Overhead costs. The foreman is directly concerned in each one of these cost items. Only by training and educating the foreman in the factors of cost can management be assured of profitable production.

Direct labor costs are wages paid to men working directly on production, i.e., workers who actually are producing, building, machining, or constructing the company's product.

Direct material costs include all costs of materials which eventually become part of the final product.

The most important and most complicated of these three items, that of overhead cost and expense, breaks down into many classifications, most of which concern the foreman.

1. Indirect labor. This includes the wages of maintenance men, sweepers, truckers, inspectors, watchmen, shop clerks, etc.

2. Depreciation. In many industries, depreciation depends on the nature of the equipment and the care given.

3. Cost of light, power, heat and water.

4. Cost of insurance.

5. All salaries.

As a general rule overhead expenses remain fairly constant. But minimum overhead expense per unit of product is obtained only when a plant runs continually at capacity. Shutdowns for any reason are very costly, for a company is bound to lose heavily from its overhead when its plants do not run at capacity.

Training Foremen to Cut Overhead Expenses

How does management train its foremen to cut overhead expenses? Here is the answer to management's real stake in training foremen.

A foreman is trained to recognize, understand and control waste, whether in human form, or supply. He must:

1. Reduce accident expense by eliminating accident cause.
2. Minimize depreciation by better care of equipment, tools and machinery.
3. Economically supervise use of heat, water, light and power.
4. Select capable men for positions of responsibility.
5. Reduce waste of supply.
6. Safeguard the plant against fire, boiler and man hazards.

Foremen must be trained to:

1. Carefully select and place men on the right jobs. Management gains in training foremen particularly when it includes the lower levels of supervision. This makes it possible to replace a supervisor in the event he is elevated to a more responsible job, or leaves the company. In this instance, the company is in a position to replace that supervisor without loss of production because the incoming supervisor has already had sufficient training to fill the gap with practically no loss in efficiency.
2. Plan the work in advance.
3. Economically and efficiently lay out his department for full production.
4. Line up his equipment to promote efficiency.
5. Break men in and instruct them properly.
6. Win the co-operation of the workers.
7. Improve working conditions.

NOTE: This paper was presented at an Educational Session of the 51st Annual Meeting, American Foundrymen's Association, at Detroit, April 28 to May 1, 1947.

8. Work constantly to achieve less hazardous production methods in his department.

9. Reduce waste and scrap.

Foremen Transmit Policies

Foremen are the life line between top management and employees. It is through the foreman that the company should transmit its policies and views to employees. This same policy should work in reverse. Employees should have an open channel to management in order to transmit their problems. Those in top management should encourage foremen to use the channel opened to them as the need arises. The foreman must be given an opportunity to acquire a thorough understanding of management's viewpoints. This, in turn, provides the foreman with the necessary tools to carry on his work according to the overall plan.

To maintain a high level of efficiency in industry today, foremen must be continually provided with accurate information as to the manner in which the organization is functioning. The problems of transmitting information from bottom to top in many instances have not been clearly indicated. The information which flows through the supervisory structure should be an accurate representation of the problem.

In order that management may receive a factual story free from superfluous details, such information going through the various levels of the supervisors should be sorted, and only that information pertinent to the situation be compiled and presented to the members of management delegated to dispose of the problem. Only by careful sorting can management get a clear picture of the situation. By eliminating the details, management can render its decision in record time.

Training Program

What does management have to gain by training foremen to deal intelligently with representatives of the unions on matters arising in their departments? Regardless of how well an agreement has been drawn up between the parties, many problems arise that cannot be covered adequately by the agreement, or by the policies set up by the company.

In order to fortify the foreman with the necessary information whereby he may deal with the problems efficiently, management must provide a means of obtaining such information. It may mean that management will embark on an extensive training program, or a series of meetings. Regardless of the road management chooses, it spells training in one form or another. However, the most popular means of imparting information to the supervisor is through conference.

Primarily, the "conference" method of instructing supervisors in human engineering is one of indoctrination, making them management conscious, training them in the fundamentals and principles of good supervision, guiding them in the application of these principles to their own problems, and following up to see that they practice what they are taught.

They are being taught new "habits" and how to apply them with good results. The most successful conclusion to any conference is when the principles taught to the supervisors are made a part of the supervisors' own personalities. One supervisor may apply them differently than another. The principles followed must be the same, but the methods of using them will differ from supervisor to supervisor.

The foreman is trained in the importance of maintaining high productivity among his men. He is trained to carefully plan his departmental activities, to lay out his work, to improve methods and to stimulate his men to do their best.

Does Training Pay?

By what standard of measurement is management able to determine whether the program it has inaugurated is paying off in dollars and cents? Many responsible people are asking themselves these same questions. Any person responsible for training the foremen in his plant is deeply concerned and feels that management is entitled to some explanation as to whether the expenditures are justified.

To date, no satisfactory yardstick has been produced to determine the dollars-and-cents value of a training program; however, benefits may be determined by the following:

1. Time required to bring new employees up to average production.
2. Reduction in the number of man hours lost through unsafe practices.
3. Reduction in scrap.
4. Reduction in the number of complaints registered by employees.
5. Number of grievances going beyond the first step.

We all agree that the training program does produce results, but how are we going to prove that these results can be attributed to the training program? The information submitted must exclude new procedures, new methods and any changes in the reorganization of the plant. To discount all of the above factors would be impossible under ordinary circumstances. Perhaps it will be impossible to prove to our complete satisfaction that our reasoning is positive. However, we can be sure that our calculations are partially correct.

What Has Management Gained?

Events of the past few years have proven conclusively that the training of foremen has more than paid for itself. One cannot evaluate the returns in dollars and cents, but can only look at the foreman training program from the standpoint of increased quality, efficiency and morale building which cannot be properly evaluated.

What are the results obtained from training supervisors in the conference room, and what does management gain? The first question naturally would be: Have the supervisors in a plant improved because of the conference method? Those who are directly connected with the conference program feel there is a steady and definite improvement in supervision. First, they point to comments from employees which seemed to suggest such improvements. Second, there are the supervisors' own comments and admissions on the subject. Third, management believes that the training program was beneficial, both from a financial and a morale building standpoint.

Following are indications of the success of a training program for supervisors:

1. Employees' comments of a specific nature. Their reference was to specific changes which they had noted in their supervisors after the supervisors had been attending conferences, in comparison to their views and actions on the same problems before the training program was inaugurated.

2. One way of proving that a supervisors training program is fulfilling its purpose is to get the reaction directly from the supervisors themselves. On the whole, their reactions to the program are favorable. They are able to see their own practices through the eyes of the employees. From their discussions with other supervisors, they learn that their problems in many respects do not differ from those of any other supervisor. From the opinions of other supervisors on problems similar to their own they are able to see how other people handle such difficulties. In addition to offering the supervisor an opportunity to meet and exchange ideas with fellow supervisors, it affords him an opportunity to build friendships which are not only beneficial in promoting new co-operation between departments, but result in many "get-togethers" outside of regular work. In view of the progress made by supervisors thus far, it is evident that management has made many gains.

MINIATURE FOUNDRY EXHIBIT CONDUCTED BY APPRENTICES

Hoping to arouse public interest in the foundry as a place to work, the related foundry training class of Winona, Minn., with Leo J. F. Brom as instructor, prepared an exhibit of typical foundry processes for display at the local public library. The first display acquainted the public with the molding and coremaking procedures.

Prior to making the exhibit, the class studied molding, coremaking and drafting in its regular evening classes, and so decided to show the steps of these processes. The casting to be made was a small three-cornered nut with a cored center hole.

The first step was to make the blueprint. One member of the class made the print, using the knowledge he had acquired in previous classes. On completion of the blueprint, a few members of the class worked on the patterns and coreboxes while the remainder made the miniature flasks and tools in the woodworking shop. The 2¾-in. nut was made in flasks that measured 4 x 6 in., with a 1¼-in. cope and 1¾-in drag.

Members of the class collected the various ingredients for the core mix and the molding sand from the foundries they represented. These ingredients were placed separately on a table, cards explaining their use. With the sample core mix and a number of identical coreboxes, the various steps from the ramming of the core to the complete core were shown in the exhibit.

In like manner, with a number of flasks and patterns and descriptive cards, the molding operations were explained. One member of the class took two of the completed molds to his foundry to be poured. These were used to show the shakeout and the finished casting. The exhibit was completed with a list of the local foundries and sample castings of the three-cornered nut made of the different alloys poured by the foundries in this community.

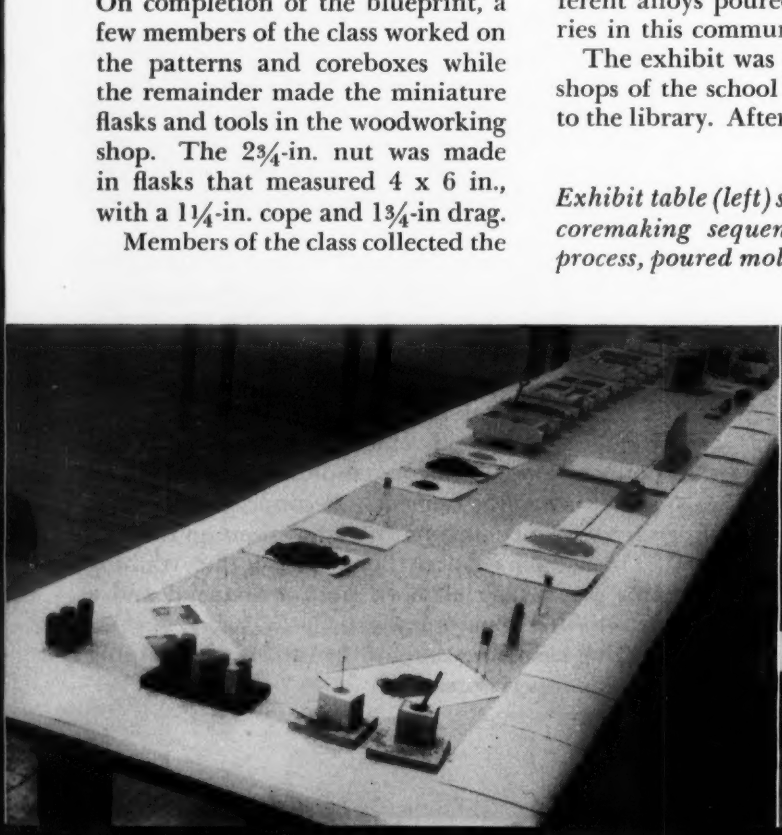
The exhibit was prepared in the shops of the school and transferred to the library. After the exhibit was prepared, the class spent a few meetings studying report writing and preparing this paper.

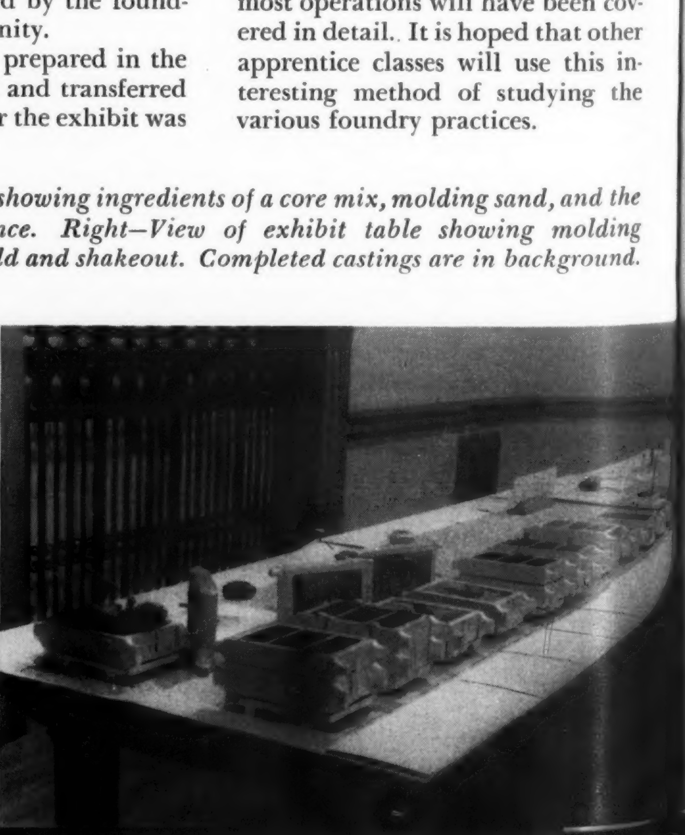
By planning and making this exhibit the apprentices gained some knowledge of the different phases of foundry work outside of their own departments. It helped the beginners to better understand foundry work and their part in it, and created public interest in castings.

The display has proved interesting to many who regularly attend the library, and to vocational, high school and college classes which made special field trips to see it. The local newspaper carried a description of it. As far as the class knows, this was the first display of its kind, and many who viewed it voiced a desire to see other phases of the foundry industry displayed.

This fall the class plans to exhibit another phase of the foundry industry, probably the melting department. By the end of four years, most operations will have been covered in detail. It is hoped that other apprentice classes will use this interesting method of studying the various foundry practices.

Exhibit table (left) showing ingredients of a core mix, molding sand, and the coremaking sequence. Right—View of exhibit table showing molding process, poured mold and shakeout. Completed castings are in background.





A. F. A. PRESIDENT MEETS WITH FIVE WEST COAST CHAPTERS

A.F.A. National President Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va., completed on October 21 an extensive tour of West Coast A. F. A. chapters. This is the second consecutive year that the Association's highest official has visited the chapters in California, Oregon, Washington and British Columbia, Canada. W. W. Maloney, A.F.A. Secretary-Treasurer, Chicago, joined the President in San Francisco to participate in the final stage of the trip.

President Kuniansky visited Vancouver, Seattle, Portland, San Francisco and Los Angeles on official business, during the course of which he addressed regular chapter meetings, special management groups and chapter boards of directors. The purpose of his talks were to bring West Coast foundrymen up to date on activities of the American Foundrymen's Association and to express the cooperation of the national organization with foundrymen in the far West.

Holds Management Session

Arriving in Vancouver, British Columbia, Canada, October 5, President Kuniansky met with a group of top management representatives October 6 at a dinner meeting held in the Hotel Vancouver. Purposes of the Association and advantages of membership and taking part in chapter activities were explained.

The following afternoon, Mr. Kuniansky sat in on a meeting of the British Columbia chapter's board of directors, headed by Chapter Chairman Norman Terry, Canadian Sumner Iron Works Ltd., Vancouver, at the Hotel Vancouver. That same evening at the Hotel Georgia, he presented a non-technical talk on A. F. A. aims and accomplishments and officially installed the chapter as number thirty-seven.

Visits Washington Chapter

Following his successful sojourn in Vancouver, President Kuniansky visited Seattle, Wash. Here on October 9 he talked before another group of top management at the Washington Athletic Club. He met with the Washington chapter board of directors on the afternoon of the 10th and at its regular chapter meeting the same evening spoke on "Chemically Bonded Sands." Chapter Chairman C. M. Anderson, Eagle Brass Co., Seattle, presided at both board and chapter meetings.

In his technical talk the President explained how the Lynchburg Foundry Company had experimented for more than a year adapting a chemically treated sand process to large scale gray iron foundry operations. A number of advantages were described as well as the process used in coating the sand with chemicals.

Dropping down to Portland, Oregon, Mr. Kuniansky was privileged to address a called meeting of top management and received from them assurance that their companies would continue interest in the local chapter and urge their employees to play an active part in its affairs.

Above—Inauguration banquet held by the British Columbia chapter during the President's recent tour.

The A.F.A. President attended the regular meeting of the Oregon chapter held October 13 at the Heathman Hotel. Presiding officer was Chapter Chairman A. R. Prier, Oregon Brass Works, Portland.

The following afternoon at the board meeting President Kuniansky complimented the organization on its steady growth since formation in March, 1945.

Leaving the Pacific Northwest, the President next visited the San Francisco Bay area, where he inspected a number of foundry plants and held several meetings with members of the Northern California chapter. On October 15 a management luncheon was held at the Mark Hopkins Hotel with Mr. Kuniansky as the feature speaker.

The 17th, President Kuniansky attended the Annual Golf Party of the Northern California chapter held at the Orinda Country Club. The members and guests enjoyed the afternoon of golf and other sports and the distinguished visitor addressed the dinner meeting briefly, bringing the greetings of the A.F.A. National Directors and Headquarters Staff.

Inspects Los Angeles Foundries

Moving on to the final stage of the tour, the President and Secretary Maloney rounded out the West Coast trip with an inspection of the Southern California chapter, commencing with a regular chapter meeting October 20 at the Rodger Young Auditorium, Los Angeles. Guest speaker was Lester B. Knight, Lester B. Knight & Associates Chicago, and his subject was "Foundry Modernization." A "full house"

(Concluded on Page 88)

ANTHRACITE AS CUPOLA FUEL

C. C. Wright
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The Pennsylvania State College
State College, Pa.

In this issue, the first installment of the paper originally presented before the Fifth Annual Anthracite Conference, at Lehigh University, Bethlehem, Pa., May 8, 1947. The second and concluding installment will appear in the December issue.

The literature relating to the selection of fuel for cupola operations is extensive, but that covering the period when anthracite was widely used is relatively weak in factual data. The major facts to be gleaned are that anthracite replaced charcoal as the principal cupola fuel sometime about 1830 to 1840, and by the middle of that century was considered the standard cupola fuel. For nearly 50 years anthracite enjoyed a virtual monopoly on this market, and it was not until the turn of the present century that coke was first introduced as a substitute fuel.

Initial inroads made by coke were largely on the basis of lower cost of fuel, and there was considerable discussion among foundry operators as to the relative merits of the two fuels. The majority first condemned coke on the basis that it did not produce hot enough iron, although there were some who believed that the use of coke did promote faster melting.

For several years mixed fuels were used in a great many foundries, with about every possible combination from anthracite beds and coke splits to coke beds and anthracite splits being employed. The metal from these operations is generally described in qualitative terms such as hot, cold, fluid, lively and fast, while melting rates and fuel-iron ratios are described in similar qualitative terms which do not necessarily mean the same thing to any two operators.

Fuel Economics

As is invariably the case with the American industry, it was not long before methods were worked out for successfully using the lower cost material, and early in the present century coke displaced anthracite from most of the foundry market outside the immediate environs of the anthracite region. Since coke has been able to maintain its price advantage during most of the present century, there has been little incentive for the use of other fuels, and only in recent years has any real attempt been made to re-establish the use of anthracite for cupola fuel even in foundries within the anthracite region.

Whatever may be the future economics of the use of anthracite, the present shortage and price of coke is such that anthracite could be used to advantage in many foundries throughout the East if sufficient technical information were available concerning its use.

During the late thirties and early forties, J. F. K. Brown of the Hudson Coal Co. made an extensive study of the use of anthracite in the 36-inch cupola located at the Providence Shops in Scranton, Pa., and has reported his findings at previous Anthracite Conferences.[1]

Early in 1941 The Pennsylvania State College undertook, as part of its research program for the anthracite industry, an extension of the work initiated by Mr. Brown. The investigation was carried out in cooperation with Mr. Brown and his associates at the Providence Shops. It is the purpose of this paper to present the results of this investigation on the use of anthracite as cupola fuel in the hope that it may assist those interested in its use for this purpose to obtain the best possible performance, and possibly may stimulte further research along related lines.

Criteria of Cupola Performance

Before presenting or discussing any of the experimental work which has been completed on the use of anthracite as cupola fuel, it is of interest to decide upon what basis the performance of anthracite or any other fuel should be evaluated. Depending upon the requirements of the particular foundry, one or more of the following usually serves as the basis: (1) melting rate, (2) metal temperature, (3) metal quality, (4) fuel efficiency, and (5) size of taps.

It should be emphasized that wide variations of opinion exist concerning the method of determining each of these factors and their relative importance.

Melting Rate

Several methods are used for reporting the melting rate in cupola operations, depending upon whether the time required for the first tap is included and whether the rate obtained during the melting of the last few charges in the cupola is considered. If the overall rate is used, the amount of time required for the first tap plays an important role when the total operation amounts to but an hour or two, while for runs of several hours' duration the extra 10 or 15 min required to preheat the charge and cupola is inconsequential.

Similarly, conditions during the melting of the last few charges are not as favorable to high melting rates, high temperatures, and good quality metal. In some foundries it is common practice to add one or two extra charges of iron and coke or an extra charge or two of coke on top of the last metal charge. Most of this metal and/or coke is subsequently recovered in the drop and is not actually melted or consumed—its primary purpose being to insure normal operation until the last of the required metal has been melted.

In order to compare the melting rates for different foundries, therefore, it would appear logical to consider only that period during which substantially constant conditions are obtained.

Metal Temperature

For cupola operation, where any measuring instrument is used at all, metal temperature is almost invariably determined by means of the optical pyrometer. Unfortunately, this instrument, which is designed for determining temperature only where black body conditions exist or where the exact emissivity of the observed material is known, may give results that are often extremely misleading. In the temperature range of cupola operation (2500 to 2900 F), molten iron has an emissivity of approximately 0.37, the exact value being a function of the true temperature and the composition of the metal. Iron oxide has an emissivity that will vary between about 0.92 and 0.95, while slag will have an average emissivity of about 0.65.

It is obvious, therefore, that if the correction for molten iron (the usual practice) is applied to readings which are taken on an oxide film, or on slag, the temperature reported will be in considerable error. This error may amount to as much as between 100 and 200 F. For control purposes the absolute temperature is relatively unimportant and optical pyrometer reading will generally give satisfactory relative results. Comparison of data obtained by different operators under the different conditions existing in different foundries, however, may be open to question.

Assuming that the correct relative temperatures are secured, the problem of interpreting the results still remains. In a few commercial operations in which observations have been made by the author, or where data of known reliability have been found in the literature, metal temperatures have remained substantially constant throughout the heat.

More frequently, however, it has been observed that the temperature attains a maximum after about three-quarters of an hour of operation and then falls gradually during the remainder of the heat, and especially during the melting of the last few charges. Most foundries appear to take this temperature drop for granted and, as long as the last metal tapped has sufficient fluidity for casting, they consider the performance satisfactory for their practices.

Maintaining Constant Temperature

Other foundries prefer to maintain the temperature constant throughout the operation. Thus the relative importance of constant temperature depends upon the particular foundry. Similarly, some foundries because of the physical layout of the floor, the nature of the castings made, or the need for ladle additions, insist upon metal in the temperature range (optical pyrometer) of 2750 to 2850 F. More frequently, temperatures in the range of 2650 to 2750 are preferred for general foundry work. Thus, again the requirements of the particular foundry must be considered in interpreting metal temperature results and requirements.

Throughout the work at the Providence shops, metal temperatures were determined by means of the optical pyrometer and attempts were made to maintain substantially constant temperature conditions throughout the heat by varying the methods of operation.

Specifications for quality of metal vary appreciably from foundry to foundry, depending upon the type of castings sold. Many of the smaller foundries appear to rely largely upon visual observation with occasional tensile strength tests. Some foundries sell on sulphur and tensile strength specifications, and have definite specifications for both tensile strength and chemical analysis.

Probably the most significant and critical specifications are those based on use properties of the finished castings. To some extent, the chemical analysis and physical properties can be controlled by the method of operation, but to a much greater extent these variables are dependent upon the type of scrap, the percentage of alloy materials, if any, added in the charge or to the ladle, and upon inoculation practices.

The general opinion exists that the analyses of the fuel and of the ash in the fuel may influence the chemical composition of the metal, particularly in the matter of carbon and sulphur pickup, and considerable literature exists on this subject. No factual information applicable to the use of anthracite appears to be available. It appears highly probable, however, that the type of metal in the charge, the size of the fuel, and the blast volume are to be considered as much more significant factors than the fuel composition.

Fuel Efficiency

Considerable discussion appears in the technical literature concerning fuel efficiency, yet the significance of much of the information is open to serious question. The fuel efficiency is defined as the pounds of iron melted per pound of fuel used, and depends in part upon the overall time of operation, upon the melting rate and melting temperature desired, upon the routine of operation necessary in the particular plant, and to some extent upon the fuel used.

In cupola operations, from one thousand to several thousand pounds of fuel may be used in the bed, and its primary function is to support the burden of the cupola charges. Although that portion located above the tuyeres also enters into chemical combination with the oxygen of the air blast, it is continually replenished by fuel in the splits, hence the quantity in the bed remains substantially constant. Obviously, in short operations of 1 to 2 hr where the bed charge may amount to from 25 to 50 per cent of the total fuel employed, the overall efficiency will be relatively low as compared with the plant operating for several hours and burning a total of several thousand pounds of fuel.

Thus, two separate figures may be reported, one based on overall efficiency and the other upon the ratio of iron to fuel used, exclusive of bed fuel. For operations which may last long enough for the cupola to attain equilibrium conditions, the latter figure gives a reasonably accurate picture of the efficiency attained. For short operations, however, the cupola frequently does not attain equilibrium conditions and the fuel may be consumed at a higher or lower rate than it is charged into the cupola.

In general, operations employing continuous tapping will show higher efficiency than those using intermittent tapping because in the latter case the radiation loss from the metal in the well will be higher. Likewise, operations where it is common practice to shut off the blast for several minutes to wait until the ladle or casting crew can take the metal will show lower efficiency than operations in which the blast is maintained.

Because it is the combustion of the carbon of the fuel that produces the heat utilized in melting the iron, it is apparent that fuels with different percentages of carbon will give different efficiencies. There is also some question concerning whether or not differences in reactivity of the fuel may not in some cases affect the efficiency of the melting operation. Little factual information on this score is available.

Size of Taps

The well of a given cupola is supposed to have a definite capacity which varies with the cupola size and design. If for any reason the use of a given fuel results in lower well capacity or in a progressive decrease in well capacity during operation, the time and labor expended in handling a given weight of metal is increased, and in some cases the pouring of large castings is complicated if not made impossible. Where continuous pouring is employed, the well capacity becomes of minor significance, but many of the smaller foundries operate on the intermittent basis. All the test results reported for anthracite in recent years have been obtained in cupolas employing intermittent taps.

Although the foregoing discussion touches but briefly upon a few of the more important factors which affect the evaluation of cupola performance, it will be readily apparent that the interpretation of test data from cupola operations is open to rather wide variations in judgment, depending upon the viewpoint of the individual and the type of operation that he wishes to secure in his particular foundry.

Factors Influencing Cupola Operation

Although the combustion of fuel in a cupola appears to be one of the simplest of operations, in which air is blown through a deep bed of ignited fuel, there are actually a number of important variables which affect the overall result. Among these variables probably the most important are methods of building the bed, air volumes, air pressures and air distribution, size and kind of fuel, and slag formation. As part of the overall program on the use of anthracite these variables were studied and, although the results were not always conclusive due to the fact that the variables are interrelated and difficult to control, some interesting observations were made.

The basic chemical reactions occurring in the cupola may be shown as:

(1) $C + O_2 \rightarrow CO_2 + 14{,}450$ Btu/lb of carbon

(2) $CO + C \rightarrow 2CO - 5{,}850$ Btu/lb of carbon

Considerable fundamental information regarding equilibrium constants and reaction rates is available for these reactions, and one might expect that it would be relatively simple to predict exactly what would happen in the deep bed of fuel in the cupola. Unfortunately, this is not always possible because the controlling factors are physical rather than chemical.

Concerning reaction (1), the following points are of interest in cupola operation:

(a) The reaction is strongly exothermic; hence, as the reaction proceeds the temperature of the fuel bed rises until heat output in the form of radiation, conduction, and sensible heat loss balances heat input from the heat of reaction.

(b) At fuel bed temperature the chemical reaction is virtually instantaneous and is not a controlling factor in determining the overall combustion rate irrespective of the kind of fuel burned, whether it be graphite, charcoal, coke, anthracite or other form of carbon.

(c) In deep fuel beds the region of maximum dioxide content will correspond very closely with the region of maximum temperature. The oxygen concentration at the point of maximum carbon dioxide concentration will have been reduced to one per cent or less and, if uniform sizing and normal packing of the fuel in the bed exists, this reduction in oxygen concentration will occur in passing through a depth of fuel bed equivalent to 5 to 7 lump diameters of ignited fuel.

(d) The distance through the bed which the oxygen can penetrate, assuming normal packing of the bed, is for all practical purposes independent of the type of fuel and of the blast rate or volume, and is a function only of the size of the fuel.

Concerning reaction (2) the following points are of interest:

(a) The reaction is strongly endothermic, hence as the reaction progresses it absorbs heat from the bed.

(b) The reaction is incomplete even at the high temperatures existing in the hottest part of the fuel bed, and is less complete the lower the temperature. Hence, the conversion of CO_2 to CO is less complete the greater the distance from the primary zone.

(c) The rate of the reaction is a function of temperature, time of contact and reactivity of the fuel. Hence, the rate is influenced by the distance from the primary reaction zone, by the rate of gas travel which in turn is primarily a function of blast volume, and by the type of fuel. According to the best data available, if the time of contact and the size of fuel are held constant, the rate of the reaction is faster with coke than with anthracite at temperaures above 2000 F, and slower at temperatures below 2000 F.

Introducing Blast Uniformly

The foregoing considerations are depicted graphically in Fig. 1, which represents an idealized case in which the blast is introduced uniformly across the cupola at tuyere level. Actually the zone of maximum temperature and the melting zone probably assume more nearly an inverted cone shape because the blast is introduced through tuyere ports in the wall of the cupola. The distance from the tuyeres at which the fuel bed temperature is reduced to approximately the melting point of iron ("x" lump diameters above the tuyeres) is a function of blast rate and fuel reactivity.

Similarly, the shape of the gas composition curves above the tuyeres will vary with the blast rate. The effect will be most noticeable on the CO and CO_2 curves

above the zones of maximum temperature. The higher the blast rate the closer together will be these curves and the higher the melting zone, since it is the conversion of CO_2 to CO that reduces the temperature. Assuming constant blast rate and the same size fuel, the height of this melting zone should be slightly higher with anthracite than with coke because the reduction of carbon dioxide to carbon monoxide—hence removal of heat from the bed—should be slower.

Prior to actual operation of the cupola for melting tests, an investigation was made to compare the flow pattern and distribution of gases in the cupola when egg-sized coke and egg-sized anthracite were burned at blast volumes comparable to those normally used in the melting operations at the Providence foundry (240 cfm/sq ft of cupola area at tuyeres).

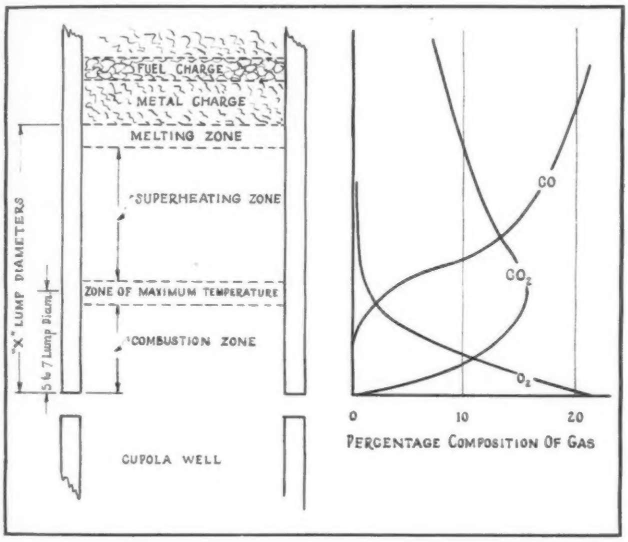


Fig. 1—Diagram representing ideal conditions for uniform introduction of blast across cupola fuel bed.

A series of water-cooled tubes was inserted into the fuel bed at five equidistant levels between 2 and 26 in. above the tuyeres. Independent sampling ports were located along these tubes at distances of 2, 8, 14, and 18 in. in from the wall of the cupola. Pressures were recorded and samples extracted from the cupola for Orsat analysis. Although several duplicate tests were made, the flow patterns and gas compositions were never exactly the same.

Undoubtedly the presence of the sampling tubes distorted the patterns and may even have influenced the actual combustion due to the large amount of heat extracted in the form of heated water (necessary to keep the tubes from melting). The general trends shown diagrammatically in Fig. 2 were, however, similar for all the coke runs, and the several anthracite runs showed general similarity. The examples used are two of the most exaggerated cases and were purposely selected in order to emphasize one of the major problems encountered in the use of egg-sized anthracite, namely, penetration of air into the bed.

In all the burning tests the results with anthracite showed that in comparison with coke the oxygen was consumed much closer to the tuyeres, the maximum

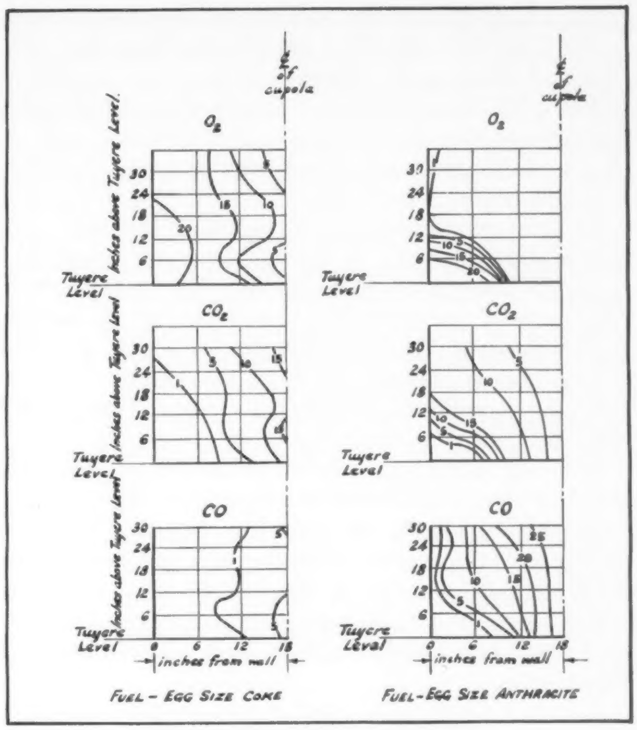


Fig. 2—Diagrammatic sketch showing percentages of O_2, CO_2, and CO in burning beds of coke and anthracite.

amount of carbon dioxide and therefore the zone of maximum temperature was reached much closer to the tuyeres, and the carbon dioxide was reduced to carbon monoxide more rapidly. The results for oxygen consumption suggest that some size degradation must have occurred with the particular anthracite used, because the oxygen was consumed somewhat faster than theory requires for egg-size coal.

With the coke, on the other hand, the reduction in oxygen concentration appears to be considerably slower than theory requires which is due to the fact that commercial egg coke was used and an appreciable portion of it was fingery, hence had an average diameter considerably greater than the size of egg anthracite.

These burning tests suggest that some advantage should be gained by using larger sized anthracite which would tend to spread the reaction zone, permit greater penetration of the oxygen, and increase the temperature in the center of the cupola. If the same conditions exist when iron is being melted as in the absence of the metal charge, the metal melted and falling through the center section of the bed would never be exposed to the zone of maximum combustion temperatures.

Furthermore, increasing the size of the anthracite, assuming the anthracite used was reasonably size stable, or employing a coke bed with subsequent chargings of anthracite should improve the air and gas distribution. Higher blast rates would also improve the center temperatures because the reduction of carbon dioxide—being a time dependent reaction—would be less complete, thus tending to spread the high temperature zone both vertically and horizontally.

Laying the Wood—A series of experiments, designed to determine the most effective way of laying the wood, was made in which the following variables were studied:

(a) Laying wood flat on the sand bottom of cupola.

(b) Hollow cone filled with blocks of wood.

(c) Hollow cone without blocks.

(d) Filling well to tuyere level with coal and laying wood flat on top of coal.

(e) Filling well to tuyere level with coal and hollow cone of wood on top of coal.

Of these modifications (c) and (b) appeared to be the most satisfactory. A marked tendency to produce hang-ups was noted with method (a) under certain conditions of pre-blast burning. Methods (d) and (e) both produced unsatisfactory initial metal temperatures, although the bed remained in excellent condition from the decrepitation (size degradation of the anthracite) point of view.

It is concluded from these experiments that the most satisfactory method of bed-building is the inverted cone formation in which the amount of wood is held to a minimum. These observations are not new as the method is common practice in many commercial foundries, but other methods have been practiced and recommended in building anthracite beds in previously reported experiments.

Minimizing Mechanical Shock

Additions of Coal to Bed—Due to the fact that anthracites in general have less mechanical size stability than coke after being heated, a series of experiments was made to determine under what conditions the bed could be made while holding to a minimum the mechanical shock of throwing the fresh coal charges into the cupola. The variations investigated include the following methods of adding coal charges to the bed:

(a) Six hundred pounds of coal on top of wood, fire lighted and burned through until all the coal was well ignited; 200 lb of coal added and burned through; 200 lb of coal added and burned through, sufficient coal (50-200 lb) added to bring bed to desired height and burned through; cupola charged in normal manner with metal and coal in layers.

(b) Four hundred pounds of coal on sand bottom, layer of wood laid flat at tuyere level and 400 lb of coal added, fire lighted and burned through; 200 lb of coal added and burned through; 50 lb of coal added and burned through; charged with metal and coal in layers.

(c) Six hundred pounds of coal on top of wood, fire lighted and burned through completely until entire bed at red heat; 500 lb of coal added, charges of metal and coal in layers added immediately.

(d) Six hundred pounds of coal on top of wood, fire lighted and burned through completely until entire bed at red heat; 200 lb of coke added (making a 6-in. coke layer at tuyere level) followed by 400 lb of coal, metal and coal in layers added immediately.

(e) Six hundred pounds of coal on top of wood, fire lighted; two 100-lb and one 50-lb addition of coal each burned through; 100 lb of brick followed by 100 lb of coal added and burned through; metal and coal charged in layers.

(f) Four hundred pounds of coke on top of wood, fire lighted; three 200-lb coal charges burned through and metal and coal charged in layers.

(g) Six hundred pounds of coke on top of wood, fire lighted and one 200-lb and two 100-lb charges of coke burned through; metal and coal charged in layers.

It was realized that several of the foregoing methods of building the bed and charging the cupola were contrary to accepted practice and were of questionable merit from a practical point of view. However, all the methods tried had either been proposed as a desirable method of building the bed with anthracite or, as with modifications (b) and (d), were tried in order to establish specific information of interest in connection with the overall size degradation problem.

Results of Tests

Of the several methods investigated, methods (g), (f), and (d) all gave good results with (d) the poorest of the three. Variable results were secured using method (e) with brick in the bed; at low and medium blast rates, without flux, metal temperatures were consistently higher and melting rates were nearly average; however, at high blast rates or when flux was used, poor results were attained.

For the methods employing only coal, method (b) gave the best bed as indicated by the absence of decrepitation but, as would be expected, the metal temperature and time of the first tap were both unsatisfactory. Method (c) appeared to have definite advantages over method (a) in that the fresh coal additions did not impart any extensive mechanical shock to the bed of heated coal above the tuyere level, and the shock of subsequent metal and coal charges was cushioned with cold coal of relatively high mechanical strength. This procedure definitely reduced decrepitation as evidenced by the size of coal in the drop.

Height of Bed—Studies were made to determine the most effective bed height when using egg-size anthracite in the 36-in. cupola (actual diameter at tuyeres 35 in.) when employing both the standard 4x12-in. tuyeres and the small 3-in. diameter tuyeres preferred at the Providence foundry.

Using a blast rate of 1,600 cfm and the small size tuyeres, bed heights were varied from 16 to 32 in. in 2-in. steps. The results indicated that heights between 26 and 28 in. were the most satisfactory under these conditions, although in many instances satisfactory performance was obtained with bed heights as low as 22 in. These results do not agree completely with those reported by Brown and Roecker[2] who found 20-22-in. beds entirely satisfactory. In part this difference may be due to slightly less decrepitation of the coal resulting from the method of bed building, or to some factor not evaluated in these tests.

Blast Rates and Bed Heights

Using the standard sized tuyeres, similar results were obtained although less satisfactory results were generally obtained at low bed heights.

Tests at low, medium and high blast rates indicate that at the high blast rates (1800-4100 cfm) bed height should be increased somewhat, while at low blast rates (1200-1500 cfm) satisfactory performance can be attained with a bed height of about 22 in.

Insufficient data have been secured using other coals to establish definitely the effect of reactivity of the coal upon the bed height, but from studies on three different

coals and on coke it would appear that the so-called lower reactivity fuels require higher beds than high reactivity fuels. The data are inconclusive, however, because the amount of decrepitation varied with the different coals studied and increased decrepitation results in more surface exposure and higher reaction rates.

Preblast Air—Careful studies were made of the effect of pre-blast air upon the overall performance and upon the time and temperature of the first tap. The pre-blast air was varied from 2,000 to 16,000 cu ft, and the time of introduction of air and soaking from zero to 2 hr.

From these tests it was concluded that the time and temperature of the first tap is entirely dependent upon the amount of air introduced and the time of air introduction. More consistent results were obtained by controlling the pre-blast air by the use of the blower rather than by relying upon natural draft which proved to be extremely variable.

Experimental data indicate that with egg-size coal *M* a pre-blast air volume of about 14,000 to 16,000 cu ft gave consistently satisfactory results when introduced at a rate not exceeding 400 cu ft per min. Higher rates produce pre-melting of metal and slag and cause subsequent difficulty with poor well capacity.

TABLE 1—PRESSURES AT TWO HEIGHTS ABOVE THE TUYERES IN A CUPOLA BED WHEN USING DIFFERENT FUELS

	Pressure, Ounces	
	2-In. Level	26-In. Level
Coke bed—coke charge	3.7	2.9
Coke bed—anthracite charge	6.8	4.7
Anthracite bed—anthracite charge	7.9	5.6

Temperature of Bed Prior to Blast—Temperature distribution studies were made at five different levels in the bed, 4, 10, 16, 22 and 28 in. above the tuyeres, at pre-blast air volume varying between 2,000 and 16,000 cu ft and at varying distances in from the walls of the cupola. Egg-size coal *M* and broken-size coal *S* were used in these studies.

Although numerous individual readings were inaccurate due to local hot spots or channelling, the general trend of the results when using egg-size coal *M* indicated that the higher the volume of air introduced the higher the maximum temperature at the level 16 in. above the tuyere. Except for the test at lowest air volume, the maximum temperature was established at the 16-in. level near the walls of the cupola. The distribution of temperature across a given level in the cupola varied appreciably, the trend being toward lower temperatures toward the center.

With broken-size coal *S* the zone of maximum temperature was a few inches higher at the same air volume, and the distribution of temperature across a given level indicated in all cases a maximum at some intermediate point between the walls and the center of the cupola. These data suggest better air distribution with the broken-size coal *S* than with the egg-size coal *M*.

Correlation of the bed temperature data with subsequent performance of the cupola was not entirely satisfactory. With both coals the slowest first tap was obtained with low pre-blast air and, in general, the higher the bed temperature and the more uniform the temperature distribution across the 10- to 16-in. levels the hotter the first tap. However, the time of first tap did not appear to correlate directly with pre-blast temperature of the bed.

Air Pressures and Rates—At the same time that the gas composition studies were made in beds of burning coke and coal, pressure distribution studies were made at blast rates of approximately 1,700 cfm (240 cfm/sq ft of cupola area at tuyere level). In general, it was observed that pressure readings across a given level were fairly uniform and varied with the height above the tuyeres and with the fuel used.

Fuel Bed Resistance

Table 1 shows typical data for three tests, one with coke bed and charge, the second with coke bed (12 in.) and anthracite charge, and the third with anthracite bed and charge. In each case the coal or coke was classed as egg-size and was charged to the level of the charging door. The pressure reading reported were obtained 45 min after the blast was started.

It is apparent from these data that the fuel bed resistance with the anthracite is greater than with the coke; this is attributable directly to the difference in actual average diameter of the two types of fuel classed as egg. Because in these tests the coal or coke was charged to the charging door level the resistance (pressure drop) was unquestionably higher than would be expected when using the normal fuel-metal splits. On the other hand, the blast rates employed in many foundries exceed the 240 cfm/sq ft used in these tests. A 50 per cent increase in blast rate would produce almost double the pressure drop.

In melting tests, blast rates from 1,450 to 2,200 cfm (approximately 210 to 315 cfm/sq ft) were studied. These rates are somewhat lower than those used in

TABLE 2—TYPICAL ANALYSES OF SHIPMENTS OF COALS USED IN CUPOLA TESTS

Coal	*J*	*M*	*S*
Source (Field)	Eastern Middle	Northern	Western Middle
Size*	Egg	Egg	Broken
Δ P**	1.4	2.1	1.4
Ultimate Analysis (Dry Basis) %			
C	87.52	81.87	83.51
H	1.85	2.57	2.14
O+N	2.50	3.02	2.31
S	0.68	0.69	0.77
Ash	7.45	11.85	11.27
Moisture (as fired) %	2.6	2.6	2.6
Ash Softening Temp., F	2,960	+3,000	2,690
Heating Value (as fired) %	13,360	12,890	12,870

* Anthracite Industry Standard—Round Hole Screens

Size	Round Hole Screen	Approximate Square Hole Screen Equivalent
Egg	$2\frac{7}{16}$ x $3\frac{1}{4}$ in.	2 x 3 in.
Broken	$3\frac{1}{4}$ x 5 in.	3 x 4 in.

** Calculated pressure drop in inches of water pressure per foot of bed depth at a blast velocity of 197 cfm/sq ft of bed, for coal subjected to mechanical shock after thermal treatment. (See Mineral Industries Experiment Station Bulletin No. 31 (1941) for details of test and evaluation of results.)

many foundries, but higher rates were not possible under the particular conditions in this foundry due to inability to handle the metal faster.

Size and Kind of Fuel—Most of the 86 melting tests completed during this investigation were made using egg-size anthracite coal *M* from the Northern Field, as this was the fuel normally used at the Providence foundry. A few tests were made with broken-size coal *S* from the Western Middle Field, with egg-size coal *J* from the Eastern Middle Field, and with egg-size coal *L* from the Northern Field. Several tests were also made with coke and with coke bed and anthracite splits.

Table 2 shows the physical and chemical data for the three coals for which melting test data are reported. In the case of anthracites other than coal *M*, too few tests were completed to be certain that optimum conditions for the use of those coals had been established. Since all the coals were either different in size or in size stability under mechanical and thermal shock, the optimum bed depth would undoubtedly differ. Similarly, the most effective quantities of flux would vary.

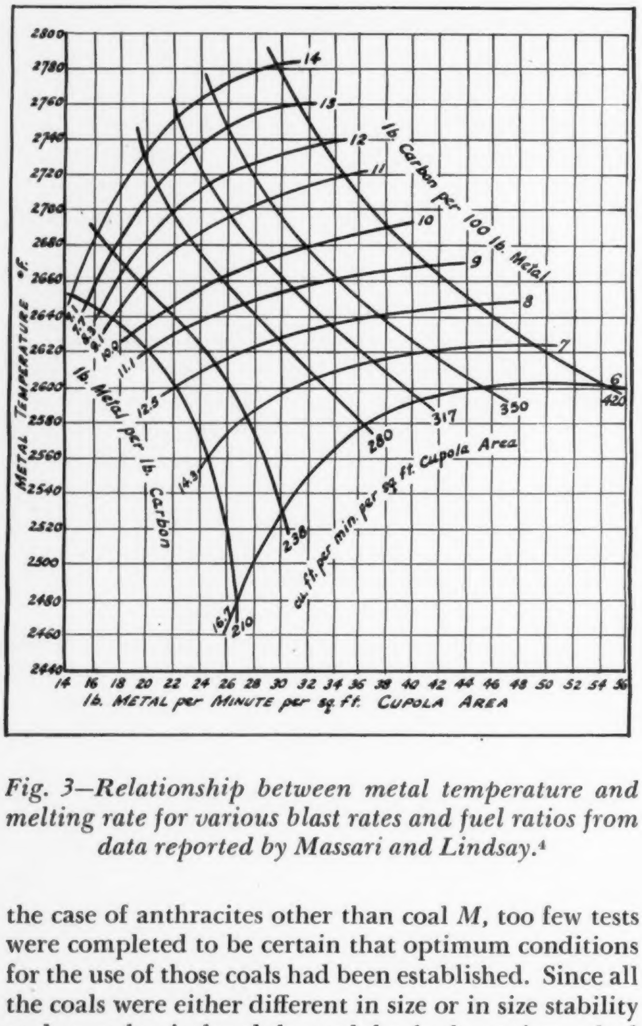


Fig. 3—Relationship between metal temperature and melting rate for various blast rates and fuel ratios from data reported by Massari and Lindsay.[4]

Iron-Fuel Ratios—In foundry operations it is common practice to refer to the ratio of the weight of metal in the charge to the weight of fuel in the splits as the fuel ratio:

$$\frac{\text{Weight of Metal}}{\text{Weight of Fuel}} = \text{Ratio}$$

These ratios frequently differ markedly from the actual metal to fuel ratios used, due to the fact that in many foundries the melting operations last only 2 or 3 hr, and during this time part of the bed may be burned away or in some cases the bed may build up.

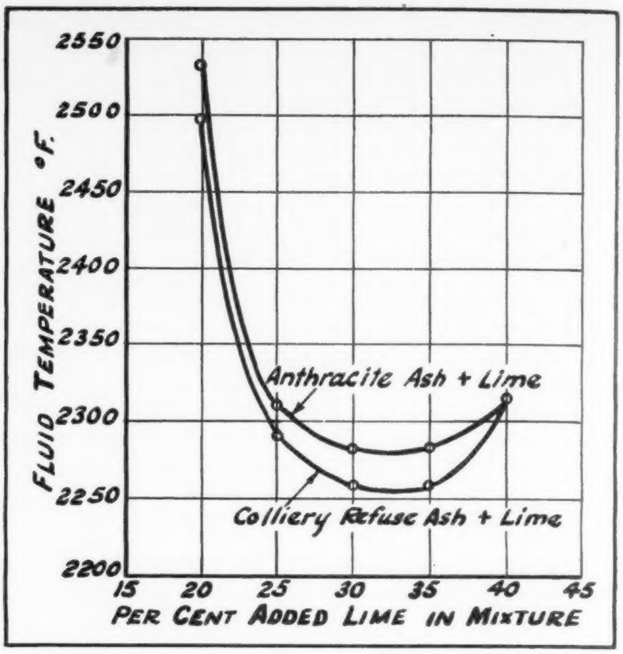


Fig. 4—Chart showing the relation of fluid temperature to the percentage of added lime flux.

This discrepancy between the ratio charged and the ratio actually used accounts for some of the claims made for unusually high metal temperatures with high fuel ratios. Actually, a very definite relationship exists between the ratio actually used, the blast rate, and the metal temperature and the rate of melting for each size of cupola. Detailed charts for various sizes of cupolas have been published in the CUPOLA HANDBOOK.[3]

Facilitating Calculations

Similar data were published in a series of German articles which was translated and summarized by Massari and Lindsay[4] prior to the war. Based on these earlier studies, Fig. 3 was developed. This chart shows fuel ratios in terms of pounds of carbon per 100 lb of metal in order to facilitate calculations when using different fuels of varying carbon content.

The most commonly used fuel ratio appears to be between 10/1 and 8/1 (about 9 to 11 lb of carbon per 100 lb of metal) unless exceptionally high metal temperatures are desired or unless appreciable quantities of steel are included in the charge, in which case the fuel to metal ratios may be appreciably higher. Throughout most of the tests with anthracite, a fuel ratio of 10/1 (1000 lb of metal/100 lb of coal) was used. In addition, calculations based on gas analyses made every few minutes showed the actual fuel ratios used. In most cases it was found that the ratio actually used differed appreciably from the ratio charged.

Flux—The problem of satisfactorily fluxing the bed when anthracite is used as fuel is somewhat more critical than with coke because in general the ash in anthracite has an appreciably higher silica and alumina content and higher fusion temperature than does the ash of cokes. At the Providence foundry it was not common practice to slag the cupola, and the operators preferred to operate without slagging since this procedure eliminated the problem of handling slag.

For their relatively short operations (10,000 to 20,000 lb of metal) the lack of slagging appeared to cause no difficulty either in cupola operation or quality of metal. For longer operations, however, slagging would be essential, and during the tests an endeavor was made to slag the bed in a large percentage of the tests.

Investigations conducted by the Anthracite Institute on the influence of added flux upon the fluidity of anthracite slags has shown that when dealing with anthracite ash only, the fluidity may be increased to a very satisfactory value by suitable additions of lime or burned dolomite. Figure 4 reproduced from a paper by Rose and Johnson[5] shows the influence of lime additions. Additional data on the fluidity of anthracite

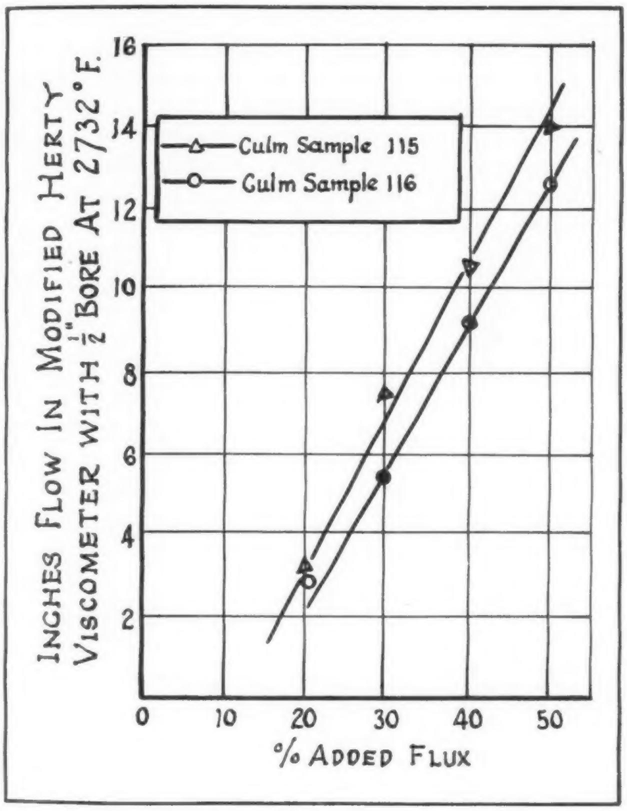


Fig. 5—Fluidity of mixture of anthracite culm ash and added flux, CaO + MgO (burned dolomite) at 2732 F determined by modified Herty viscometer (½-in. bore).

slags as a function of the percentage of added flux, Fig. 5, and as a function of the temperature as fixed flux additions, Fig. 6, are shown by R. C. Johnson.[6]

These data show that in the absence of extraneous materials anthracite ash may be slagged with 45-50 per cent flux as $\frac{x}{c}$ lime or burned dolomite, to give a slag of high fluidity. It was also reported that the use of egg-size dolomite gave better slagging performance when mixed with egg-size anthracite than did the commonly used smaller sizes of stone. The effect of the extraneous material has not been studied, nor has the oxidation value or basicity been thoroughly investigated.

In the cupola tests herein reported, small size, approximately 1x2 in., limestone was used, and the quantity was varied from 30 to 60 per cent of the coal charged

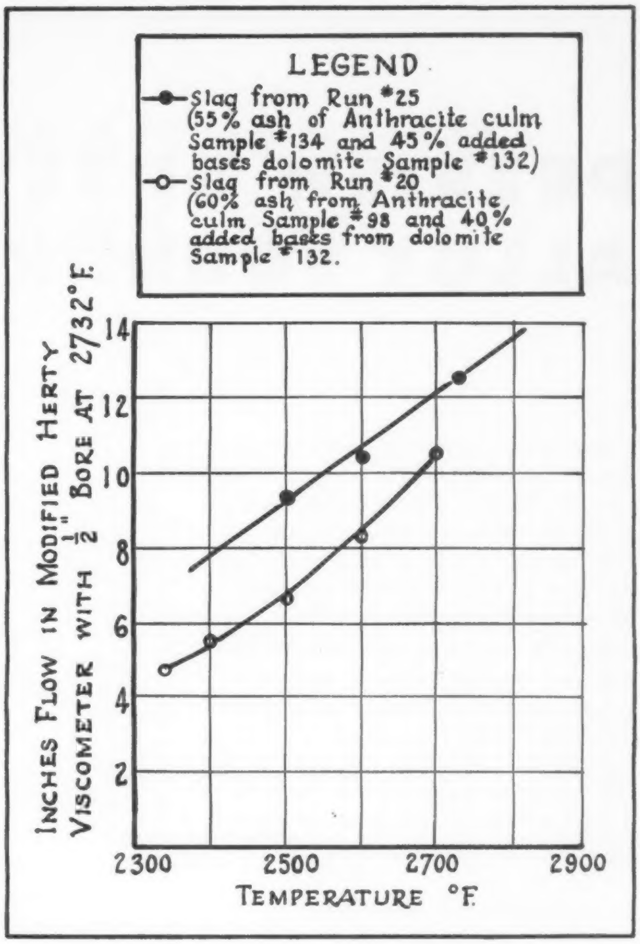


Fig. 6—Effect of temperature on fluidity as measured by the modified Herty viscometer (½-in. bore).

on the splits. In a few cases double stone charges were made on top of the first split. In many of the tests the slag appeared to be reasonably satisfactory in flow characteristics, which suggested that satisfactory slagging is entirely feasible where local conditions are such that the slag can be handled more conveniently than at the Providence foundry. It is impossible to give specific figures for the amount of flux required because the quantity of sand and dirt and oxide charged with the metal is a variable that influences the total flux required.

Performance in Melting Tests—A variety of melting tests was completed during the investigation with a view to determining the influence of specific conditions. Throughout these tests an attempt was made to hold all but one of the variables constant and to determine the influence of that one. In actual practice it was impossible to attain this objective in some cases because in addition to obtaining the desired information it was also necessary to produce melted metal at a temperature and rate permitting its satisfactory use in the foundry.

For this reason the data, in particular data regarding possible melting rates, are not so complete as would be desired. Similarly, in many of the tests conditions were purposely varied over a considerable range, with the result that relatively poor performance was secured in cases where the conditions were too far from the optimum, and the data would be of little general interest.

(Concluded in the December Issue)

PREVIEW OF ELYRIA ALLOY FOUNDRY HELD

ELECTRO-ALLOYS Division of the American Brake Shoe Co. opened its new $3,000,000 high alloy foundry at Elyria, Ohio, to inspection by the engineering and industrial press October 9. One of the most modern of casting plants, this new foundry combines the finest equipment, layout and casting methods known in a spacious steel, brick and glass building. Aptly dubbed a push-button foundry, the new plant is the result of years of research by American Brake Shoe Company's engineers and metallurgists.

Handle All Alloy Steel

One of four new plants opened by the company this year, the Elyria plant will handle all alloy steel production including that formerly made by the American Manganese Steel Division at Chicago Heights, according to J. B. Spencer, vice-president, American Brake Shoe Co.

The new plant has over 150,000 square feet of floor space. This includes the foundry which measures 460 x 280 feet, a pattern shop and storage building, a machine shop, a two-story welfare building with lunch and wash rooms, a two-story office building, a fully equipped dispensary, and a heating plant.

Clean, light and airy, the foundry is equipped with the best means of material handling including six overhead cab cranes. It is the combination, not the equipment itself that is unique according to W. F. Hoffman, president, Electro-Alloys Division. He points out that better working conditions and better equipment are essential to the production of quality products and to attract the highest type of workmen.

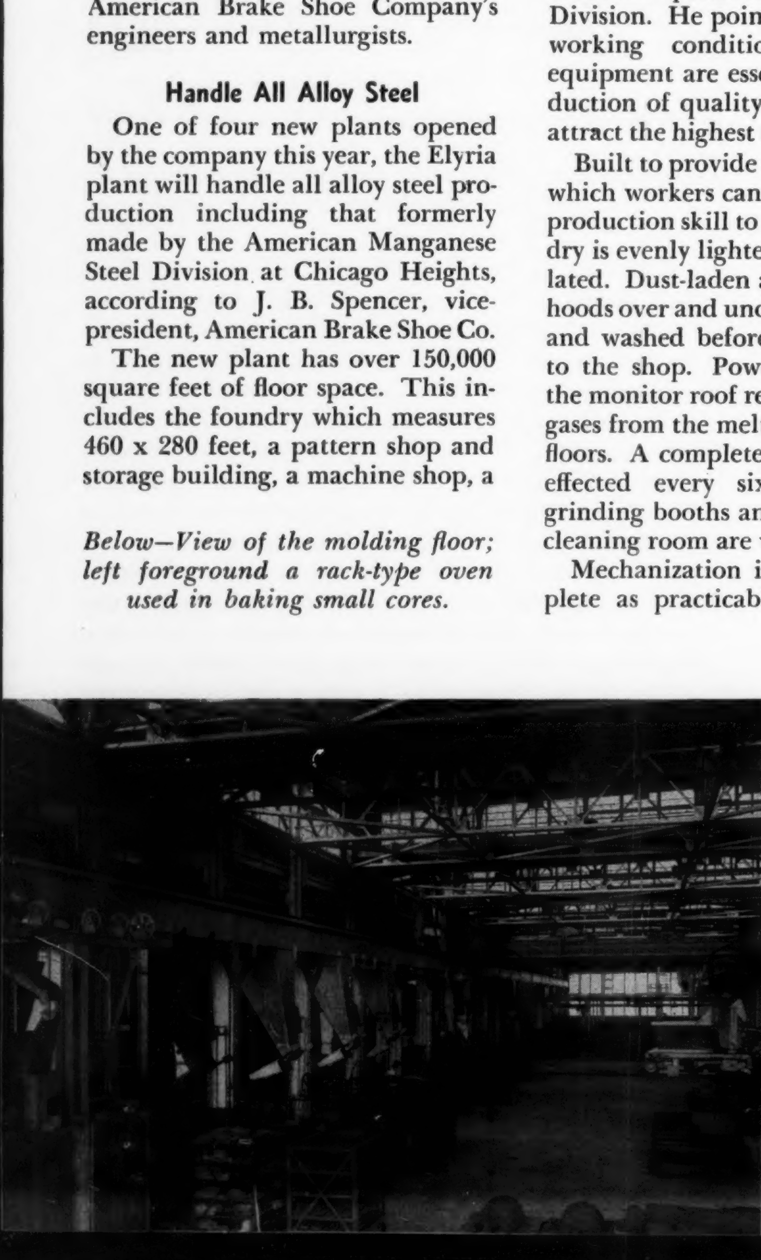
Built to provide conditions under which workers can devote their full production skill to the job, the foundry is evenly lighted and well ventilated. Dust-laden air is removed by hoods over and under each shakeout and washed before being returned to the shop. Power ventilators in the monitor roof remove smoke and gases from the melting and pouring floors. A complete change of air is effected every six minutes. All grinding booths and stations in the cleaning room are ventilated.

Mechanization is as nearly complete as practicable in a jobbing foundry. Conditioned sand, prepared in the center of the foundry moves overhead on continuous belt conveyors to 18 molding stations extending the length of the foundry. From the mechanical shakeout, the sand is returned to the conditioner under the floor of the foundry. Molding equipment ranges from large jolt rollover machines to small jolt squeeze machines for snap molds. A sandslinger in the center of the molding floor is used for the larger castings. Molds move from machines to pouring stations on gravity roll type conveyors.

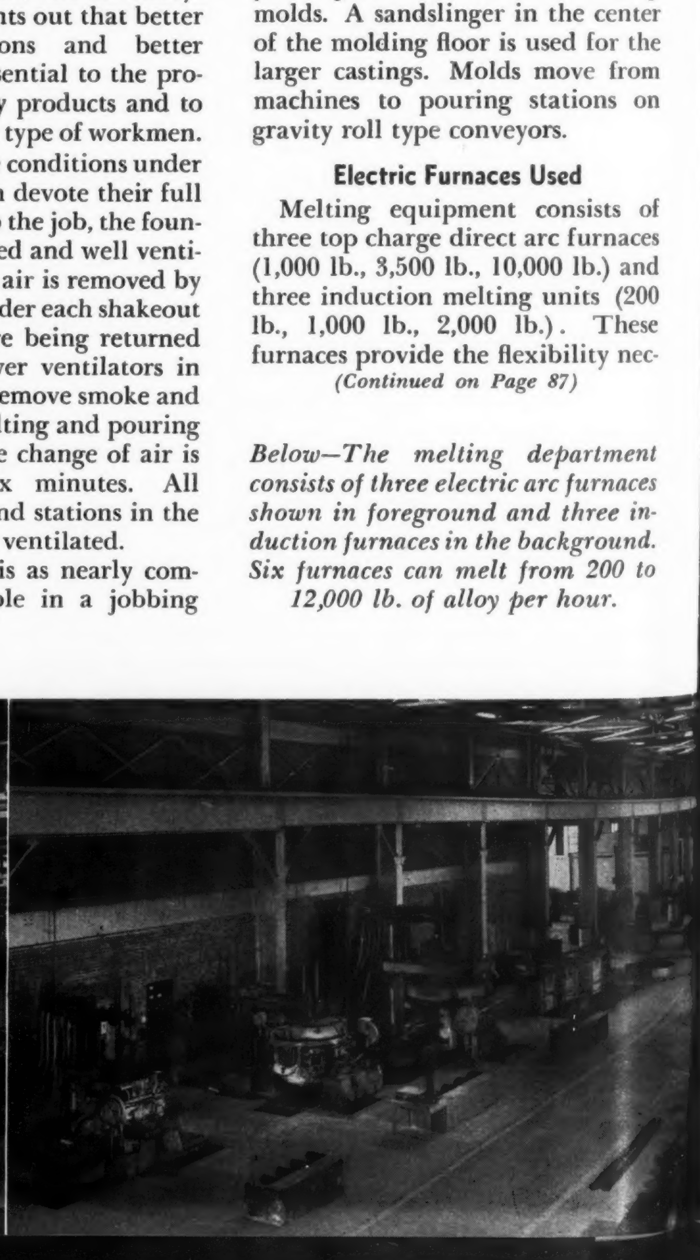
Electric Furnaces Used

Melting equipment consists of three top charge direct arc furnaces (1,000 lb., 3,500 lb., 10,000 lb.) and three induction melting units (200 lb., 1,000 lb., 2,000 lb.). These furnaces provide the flexibility nec-

(Continued on Page 87)



Below—View of the molding floor; left foreground a rack-type oven used in baking small cores.



Below—The melting department consists of three electric arc furnaces shown in foreground and three induction furnaces in the background. Six furnaces can melt from 200 to 12,000 lb. of alloy per hour.

ALUMINUM AND MAGNESIUM CASTINGS IMPREGNATION

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Metallurgist
Aluminum Co. of America
Cleveland

FOUNDRIES producing aluminum and magnesium alloy castings and the users of the castings may be confronted with the problem of eliminating leakage in castings which must be pressure tight. Limitations imposed on the designer may be such that the casting contains certain areas from which fine leaks cannot be eliminated. In such cases impregnation is a necessary step in the manufacture of pressure tight castings which will meet the service required of them.

Impregnation should not be considered as a means of salvaging structurally faulty castings because the process is effective only when the leaks are small. Leak-proofing procedures are not expedients to increase production or to maintain a high rate of manufacture in the face of the reduced quality that is sometimes associated with increased production. When used correctly, impregnation methods avoid the loss of serviceable castings and are necessary to compensate for unfavorable design and the limitations of the foundry art.

The selection of sealing materials and the methods of impregnation have been the subject of considerable experimentation over a period of years. In general, the tests have been carried out on production castings. Leak-proofing procedures were developed gradually from the production tests and standard processes were evolved for leak testing and impregnation with sodium silicate solution, tung oil, phenolic resin varnishes, styrene-resin solutions, and drying oil-resin solutions.

Leak Testing

The perfect leak test should exactly duplicate the service conditions. In actual practice, however, the many types of solutions which are held in, or flow through castings under pressure and the innumerable variations in pressure and temperature make actual duplication of service conditions impractical. A few simple test methods have been devised which will indicate whether or not a casting will be pressure tight under a wide variety of service conditions. The selection of the conditions of the test will depend on the service requirements and the size and shape of the castings.

Several methods of leak testing are commonly used. Internal pressure may be applied with compressed air and the leakage revealed by covering the casting with a film of soapy water or by immersing the casting in water.

NOTE: This paper was presented at an Aluminum and Magnesium Session of the 51st Annual Meeting, American Foundrymen's Association, at Detroit, April 28-May 1, 1947.

Pressure may also be applied by means of liquids such as glycol, mineral spirits or mineral oil, the selection of the material depending on the service conditions. Tests of this kind are used infrequently and will not be described in detail. The combination of internal air pressure and soap solution or water immersion is most widely used and a detailed description follows.

After all openings in the casting have been covered or plugged, a predetermined air pressure is applied. The usual pressures employed for testing range from 10 to 40 psi. Occasionally pressures as high as 90 psi have been applied, but experience has shown that the lower pressures are just as effective as the higher pressures, provided a suitable means is employed for detecting leaks in the particular casting type.

Special Fixture Types

Figure 1 shows a typical casting clamped in a pneumatic machine ready for pressure testing. Figure 7 shows a bank of pressure testing machines in which small motor parts are being tested.

Other types of fixtures are employed for special cases. Figure 8 shows an automobile cylinder head set up ready to be leak tested, while Fig. 9 shows a large casting plugged and capped ready for leak testing.

Whether or not the leak test will detect all leaks which might show up in service depends largely on the method of detecting the leaks. The most critical test consists of pouring or spraying a film of warm (120 F) soap solution on the casting which has been heated to 130 to 150 F. The heating of the casting may be accomplished by immersion in hot water either before or after clamping in the fixture. The initial temperature should be high enough that the final temperature after testing is not below 130 F. The soap solution is usually made by dissolving 8 oz of neutral soap powder or flakes in 5 gal of water. A typical application of soap solution is shown in Fig. 2.

The sensitivity of the soap solution is decreased by testing castings at room temperature. Very fine leaks which are detected when the casting is heated may not show up when the solution is applied to a cold casting.

Immersion of the casting and fixture in hot or cold water may also be employed to detect leaks. This method is less sensitive than the soap solution method because of the difficulty in observing the escaping air bubbles through the water. Although fine leaks may not be detected by immersion, this method has proved satisfactory in many applications.

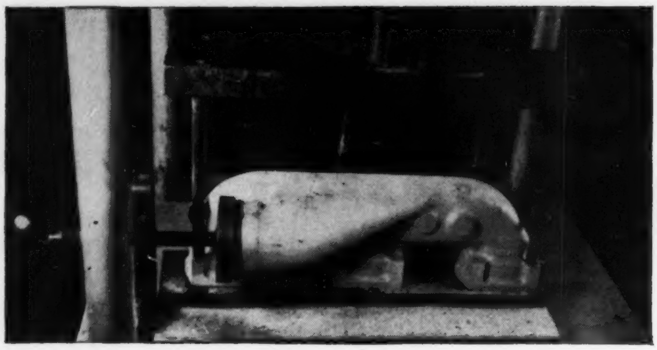


Fig. 1 — Small casting in place in a pressure testing machine. Openings in bottom and at one end of casting are closed and air pressure applied through passages in the base of fixture.

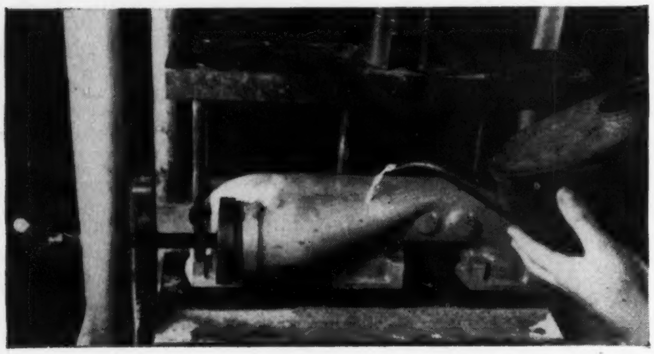


Fig. 2 — Warm soap solution poured over outside of casting reveals leaks as small bubbles when air pressure is applied internally.

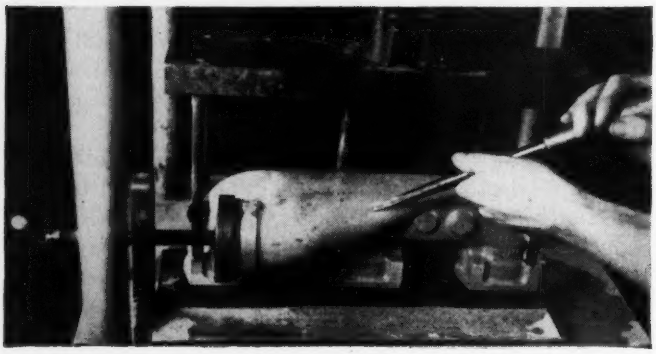


Fig. 3 — Small leaks revealed by the soap bubbles are being closed by peening with blunt chisel in an air tool.

Several methods of eliminating leakage may be used. None of these, however, should be considered as a cure-all for leakage resulting from poor foundry practice. Every effort should be made to eliminate the leakage by changes in foundry practice before the peening or sealing treatments are tried.

After the leakage has been reduced to a minimum, one of several methods may be used to eliminate the fine leaks which remain. Mechanical peening of surface may be sufficient if the leakage is very fine. Somewhat more severe leakage may be sealed with liquids which will set during air drying or baking. The commonest and most economical of these solutions is sodium silicate. Drying oils such as tung oil, synthetic varnishes of the glycerol phthalate or phenol formaldehyde types, styrene resin solutions, and drying oil-resin solutions are also used. The oil or varnish treatments may also give a surface film which provides protection from corrosive attack as well as eliminating leakage.

In some cases fine leaks can be closed permanently by peening the surface metal toward the leak with a blunt tool in a short stroke air hammer as shown in Fig. 3. The blows of the tool should be from the circumference of a small circle around the leak toward the center. The blows of the tool should not be applied directly at the point of leakage. Although the leak may be closed temporarily in this way, later sand blasting, polishing, or machining may reopen the leak. In effect, correct peening should pinch the leak shut.

Properties of Impregnating Materials

It is generally agreed that the ideal impregnating material would possess the following properties:

1. Thermosetting (infusible on reheating).
2. Capable of plasticizing to avoid formation of brittle solids.
3. Low viscosity before setting.
4. Good penetrating properties.
5. Minimum contraction on setting.
6. Insoluble in water, coolants, solvents, gasoline, and oil after setting.
7. Chemically inert to aluminum and magnesium alloys.
8. Economical and readily available.

A preliminary evaluation of impregnating materials is usually carried out in the laboratory by first determining the chemical and physical properties of the material as follows:

1. Examination before setting or polymerization.

a. Viscosity—The viscosity of the material is obtained at various temperatures. It is generally accepted that the relative penetrating efficiency of an impregnating material is increased with decrease in viscosity.

b. Chemical Effect—Immerse magnesium or aluminum alloy specimens at impregnation temperature for 24 hr and examine specimens for etching or corrosive attack.

c. Life of Impregnant—Maintain a sample of the material at room temperature and another sample at operating temperature. Examine samples daily and check viscosities.

2. Examination of setting or polymerization characteristics.

a. Time and Temperature of Setting—Place a small sample of impregnant in test tubes or capillary tubes and determine optimum setting time and temperature.

3. Examination after setting or polymerization.

a. Shrinkage—Obtain shrinkage characteristics by measuring the volume change in a small quantity of impregnant during setting.

b. Solubility—Measure weight change after immersion of set or polymerized impregnant in water, coolant mixtures, solvents, gasoline and oil at room temperature and at elevated temperatures for 48 hr. Simple immersion in high boiling solutions is

usually satisfactory. Solubility tests in solvents, gasoline and oils require refluxing.

c. Mechanical Properties—Examine set or polymerized impregnant for mechanical properties by simple fracture tests. Hard and brittle materials should be avoided.

Laboratory tests have been used to make preliminary evaluation of various new impregnating materials which are proposed from time to time. A small pressure test cup casting is used for these tests. After casting under conditions to control the degree and type of leakage the pressure cups are pressure tested, impregnated, and retested. If a particular application is involved, the cups may be given further tests under service conditions to determine permanence of sealing.

The test casting is a small cup $3\frac{3}{4}$ in. in diameter at the top, $2\frac{5}{8}$ in. in diameter at the bottom, and 4 in. high. Wall thicknesses of $\frac{3}{8}$, $\frac{1}{4}$, and $\frac{1}{2}$ in. are used to correspond to typical production casting thicknesses. The cup casting with standard gating is shown in Fig. 10.

Pressure-Test Cup

In casting pressure cups for studies of impregnating materials, several sets are made with varying degrees of leakage. With a low pouring temperature (1250 F), the gating shown will produce little or no leakage. The amount of leakage is increased by making the following changes in the order given:

1. Reduce $1\frac{1}{2}$ in. top riser to $\frac{3}{4}$ in.
2. Eliminate $1\frac{1}{2}$ in. top riser.
3. Raise pouring temperature 100 F.
4. Raise pouring temperature 200 F.
5. Raise pouring temperature 300 F.

Using these variations in foundry practice, at least two sets of cups are cast with different degrees of leakage. It is usually sufficient to cast one set with a small amount of fine leaks and one set with severe leaks.

The selection of alloy for the cups will have an effect on the type and extent of leakage. Alloys which may have fine internal shrinkage show a fine leakage. The aluminum alloys 220 (10.0 Mg, remainder Al) or 214 (3.8 Mg, remainder Al), and most of the magnesium alloys are of this type. When impregnating materials are being evaluated, one aluminum-magnesium alloy or one magnesium alloy is included in the tests. This is important because the fine leakage encountered is not common with other types of aluminum alloys.

Pressure-Tight Alloys

The aluminum-silicon alloys, such as 43 (5.0 Si, remainder Al) and the aluminum-copper-silicon alloys, such as 355 (1.3 Cu, 5.0 Si, 0.5 Mg, remainder Al) are used for aluminum castings requiring pressure tightness. Because of their good casting characteristics, they are not susceptible to leakage except in local areas where feeding is inadequate. Test cups cast in these alloys, with the feeding restricted by elimination of the $1\frac{1}{2}$ in. top riser and with high pouring temperature, 1450 to 1550 F, will show small areas of leaks. These leaks are comparable to those obtained in commercial castings with large differences in section thickness. The results of cup tests on these alloys are generally applicable to commercial castings in alloys except the aluminum-magnesium alloys.

The pressure cups require no preparation for impregnation tests after the gates and risers have been removed. Although the number of leaks may be increased by machining the cups, no change in the type of leaks will result. The as-cast surface is usually satisfactory.

Impregnating Compounds

Laboratory tests such as those described, as well as commercial use over long period of years, have established a number of materials as satisfactory impregnating materials for leak-proofing aluminum and magnesium alloy castings. The following general classes of

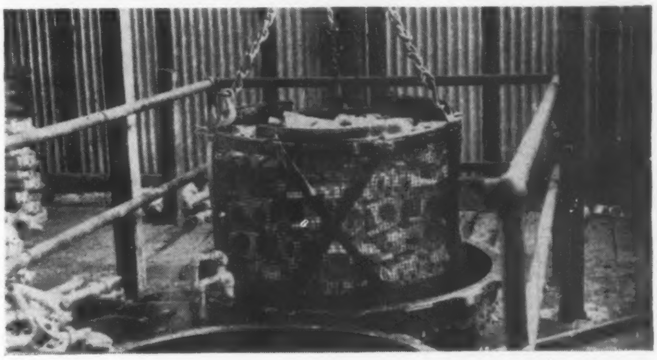


Fig. 4—Basket packed with castings to be lowered into tank of silicate solution. Solution is heated by steam coils in bottom of tank. Tank in foreground is a wash tank, likewise supplied with steam coils.

Fig. 5—Large casting being treated by pressure method. Note rubber pads and covers clamped in place.

Fig. 6—Two silicating tanks used for batch pressure silicating. Tank in background has self-sealing cover already in place while tank in foreground is open. Steam coils in bottom of tanks supply necessary heat for maintaining silicate at desired temperature.

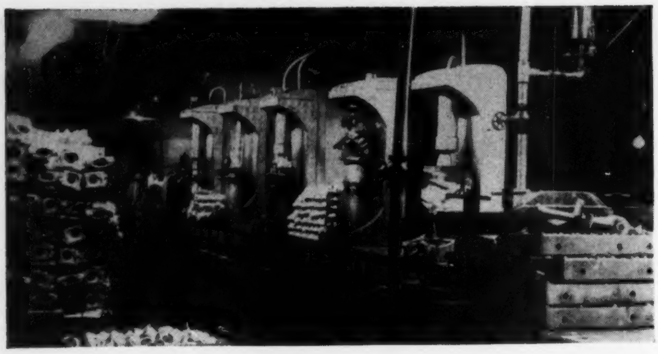


Fig. 7—Battery of pressure testing machines. Castings are held in rubber faced jigs by hydraulic pistons while pressure is applied internally.

compounds are considered satisfactory, depending upon the type of castings, type of leakage, and impregnating method used.

- Sodium silicate[2]
- Drying oils (tung oil, linseed oil)[1,2]
- Phenolic resins
- Glycerol phthalate resins
- Styrene-drying oil mixtures[2]
- Styrene-monomeric resin mixtures[3,4,5]

The materials are listed in order of their commercial use as impregnants rather than in any order of preference. Many of the oil and resin impregnants are described elsewhere (see references) and will not be detailed here. The references describe several of the materials as indicated in the table of materials. Several general references are also given.

Sodium Silicate Impregnation

Considering all of the factors in processing equipment required, procedures, cost and performance of impregnated castings, sodium silicate impregnation is probably the most generally accepted method for aluminum castings and is widely used for magnesium castings. The fine leakage which results from microshrinkage in magnesium castings and fine leakage in some aluminum castings may be impregnated more successfully with monomeric resin-styrene solutions.

A careful selection of the sodium silicate must be made, since certain grades may contain harmful alkalies. A ready mixed solution of the following composition having an SiO_2 to Na_2O ratio of approximately 3.5 to 1 is recommended.

Silica	(SiO_2)	27.0–29.0 Per Cent
Sodium Oxide	(Na_2O)	8.0– 9.0 Per Cent
	(Fe_2O_3)	
	(CaO)	
Impurities	(MgO)	2.0 Maximum
	(SO_3)	
	($NaCl$)	
Water	(H_2O)	Balance
Baume' Gravity at 65 F		39°–41°

For the treatment of castings with fine porosity it is necessary to dilute with water to 30° Baume' (at 65 F) for best results.

Castings are immersed in a solution of sodium silicate at 150 to 200 F for a period of four or more hours. At the end of this time they are removed, washed in water, and then either air dried at room temperature or baked at a temperature of 215 to 300 F. After the air drying or baking operation, castings are ready for testing.

One steel tank is required for the sodium silicate solution and another for the washing water. Both tanks should be provided with a means of heating, such as a steam coil at the bottom, to keep the contents at the required temperature. An open end air line in to the silicate should also be provided as a means of agitating the solution when it becomes too sluggish and to keep a sludge from forming on the bottom. A mono-rail hoist above the tanks will facilitate the handling of the castings from the silicate solution to the wash.

The silicate solution should be heated to 150 to 200 F before the castings are placed in the tank. Small castings may be packed in steel wire baskets, such as shown in Fig. 4, in such a manner that the solution will drain out freely from each casting. The basket should be totally submerged in the silicate and left for a period of four or more hours, depending on the type and extent of the leakage. Large castings may be suspended in the solution without being placed in a basket.

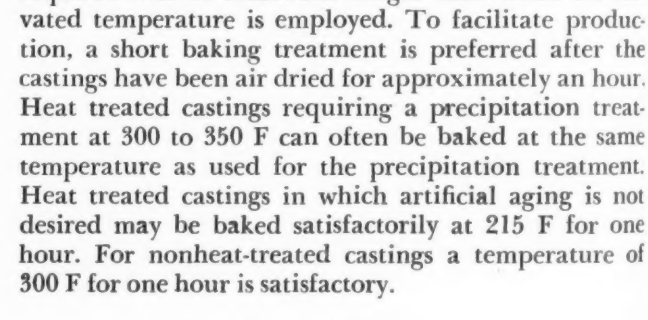
Immediately after removal from the silicate tank, the castings should be drained and thoroughly washed in water, preferably at a temperature of 150 to 180 F. Removal of excess silicate from the casting surfaces is desirable from the standpoint of appearance.

The silicate may be dried at room temperature or baked at elevated temperatures. If air dried, the time required will be somewhat longer than when an elevated temperature is employed. To facilitate production, a short baking treatment is preferred after the castings have been air dried for approximately an hour. Heat treated castings requiring a precipitation treatment at 300 to 350 F can often be baked at the same temperature as used for the precipitation treatment. Heat treated castings in which artificial aging is not desired may be baked satisfactorily at 215 F for one hour. For nonheat-treated castings a temperature of 300 F for one hour is satisfactory.

Pressure Silicating

Large castings that cannot be conveniently immersed in a tank, and castings with wall thickness greater than ½ in. can be satisfactorily treated by the pressure method. The openings in the castings are closed and

Fig. 8—Leak testing an automobile cylinder head casting. Note jig providing means for clamping rubber pads over various openings. When assembled entire unit is immersed in water to detect leaks.



hot silicate introduced on the inside under pressure. After sufficient time, silicate is drained off, surface silicate removed by washing, and the casting allowed to dry.

Special equipment is required for pressure silicating, including suitable jigs, clamps, plugs, and covers for sealing the various openings during silicating. For circular openings up to 3 in. in diameter, ordinary iron pipe plugs may be used. Soft rubber pads held in place by cover plates and clamps will serve to close circular and irregular openings larger than 3 in. in diameter. A source of air pressure, regulator valves and pressure gauges are necessary for controlling internal pressure.

After all but one of the necessary plugs have been inserted, sodium silicate solution at a temperature of 150 to 200 F is poured in until the chamber is full. The last plug, which also serves as an air connection, is put in place and a predetermined pressure applied. Too great a pressure will, of course, burst the casting so it is necessary to maintain the pressure at a safe figure. As a rule a pressure of 30 psi is sufficient.

Treatment Period Varies

The time of treatment depends upon the condition of the casting; as little as 5 min is sufficient in some cases and as much as 4 hr in others. During this time it is necessary to keep the silicate solution at a temperature of 150 to 200 F by means of some external heating method. Where all metal plugs have been used, the whole unit may be heated in a furnace. If rubber pads are used this method of heating is not satisfactory and it is necessary to direct jets of steam or gas torches on the casting surface. When applying heat, care must be taken that the internal pressure due to expanding silicate does not become too great. In some cases the external heating alone develops sufficient pressure without any air pressure being applied. Figure 5 shows a large casting set up for pressure silicating.

Immediately after draining the silicate solution and removing the plugs and covers the casting should be washed thoroughly in water at 180 to 212 F and baked or air dried as outlined under the immersion method.

Presence of air in the minute pores of a casting prevents satisfactory filling of these pores by the silicate solution, particularly when immersed at atmospheric pressure. Likewise, it is not always economical to treat small castings individually by the internal pressure methods. The batch pressure method combines the advantages of both these methods and forms a very efficient process. With this latter method, a batch of castings is immersed in the sodium silicate solution, and pressure applied to the surface of the solution.

Batch Pressure Silicating (Immersion)

A suitable tank for batch pressure silicating is shown in Fig. 6. These tanks are commercially supplied for rubber curing, artificial aging, impregnating, and processing. The flanged covers are sealed by a self-closing rubber gasket after being locked in place. The silicate solution in the tank may be heated by a steam coil, an external steam jacket, or electrical immersion heaters. A high pressure air line to supply the necessary pressure leads into the tank below the level of the solution, serving as the source of pressure and also as a means of agitating the solution. A pressure regulator in the air line and a pressure gauge in the head of the tank

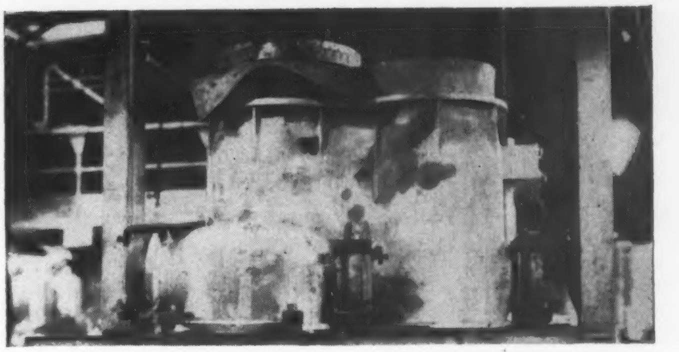


Fig. 9—Leak testing a large silicate treated casting. Soap solution is painted on surface to aid in detecting leaks.

provide a means of controlling the internal pressure applied. An open steel washing tank equipped with means for heating is also required for the purpose of washing the castings after silicating.

The castings for silicating may be packed in steel wire baskets and immersed in the silicate solution at 150 to 200 F. The tank cover is immediately placed in position and internal air pressure applied. The castings should be held in this solution for 2 to 6 hr under 50 to 100 psi pressure. The time and pressure elements are governed wholly by the condition of the castings with respect to leaks. The usual run of foundry castings may be satisfactorily impregnated over a 6-hr run at 50 lb pressure. It has been found that the use of a dilute sodium silicate solution (30 Baume' at 65 F), previously described, is required with this method of silicating. The finer porosity requires more dilute solutions.

After treatment the castings are removed and thoroughly washed in water, preferably at 150 to 180 F. The castings may then be air dried or baked at 215 to 350 F in the same manner as described under "Immersion Silicating."

Maintenance of Silicating Equipment

Sodium silicate solutions are extremely hard when air dried or baked and if allowed to accumulate in any quantities, either inside or outside of the silicating room, may be extremely difficult to remove. For this reason it is advisable to keep everything washed well with hot water and avoid any necessity for cleaning up when the solution has hardened.

Unless watched carefully and agitated each day, a sludge deposit will collect on the bottom of the silicate tank and in time solidify about the steam coils or other heating elements. To remove this deposit all loose material should first be removed and the solid material removed with hammers and light crow-bars.

The washing tank requires a change of water frequently. Failure to do this will result in an undesirable film of silicate remaining on the surface of the castings after washing.

Styrene-Resin Impregnation

Resins used in styrene-resin impregnants are usually made from glycerine, phthalic anhydride, and fatty acids, although the exact composition is not revealed by the manufacturers. Although monomeric styrene is reactive, it is stabilized with guaiacol by the manufac-

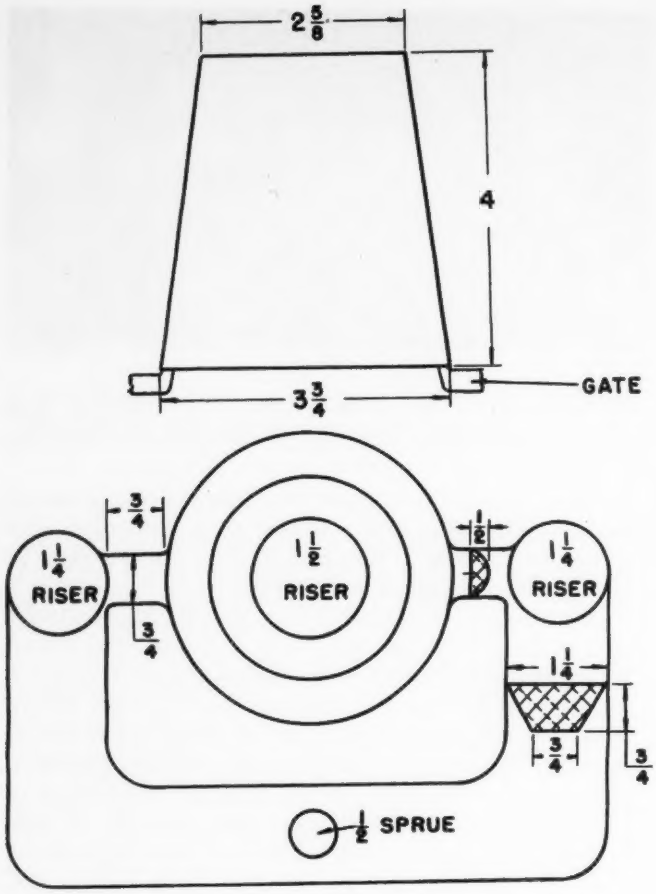


Fig. 10—Pressure test cup showing gating.

turer for long periods of time. The mixture of the two is reactive but stable enough for normal cycles, provided reserve supplies are not stored for long periods of time. A temperature below 70 F is recommended to avoid reaction during use.

Usually 25 to 40 per cent base resin in styrene is recommended for aluminum and magnesium castings. A viscosity of 10 to 25 centipoises should be maintained during use.

The direct pressure method or the batch pressure method may be used to impregnate with styrene-resin mixture. The impregnation is carried out in the same way as when silicate is used except that no heating is permitted. After impregnation the castings are cleaned with kerosene or a stabilized alkaline cleaner. The impregnant is then cured or polymerized by baking for 2 hr at 275 F. An additional 2 hr at 325 F may be employed when maximum resistance to solvents, such as gasoline, is required. Surface exudation may occur during baking at atmospheric pressure. If this is objectionable, baking under 90 lb carbon dioxide, nitrogen, or air pressure will minimize exudation.

Vacuum-Pressure Method

If the batch pressure method is not completely effective in sealing leakage and if the direct pressure method is not feasible, the vacuum-pressure method is recommended for styrene-resin impregnation. The parts are placed in a large sealed tank and vacuum of 28 in. is obtained and held for 15 min. The vacuum is then allowed to draw the impregnant into the tank, covering the parts. The vacuum is then released and a pressure of 50 to 90 psi is then applied for 15 to 30 min. The parts are then removed, washed, and baked.

Impregnation and Other Treatments

Cleaning, anodizing, painting, heat treating procedures may have some effect on impregnation or vice versa. Since both aluminum and magnesium castings are usually impregnated by the foundry before finishing, the effect of impregnation on protective coating treatments for aluminum and AMC chemical treatments on magnesium alloys should be considered.

Films of impregnant remaining on the surfaces of castings will interfere with the formation of uniform, continuous protective coatings. For this reason it is important that the castings be cleaned thoroughly after impregnation. If this is done, no interference should occur. Castings which are properly cleaned should show no visual evidence of impregnation. The protective coating treatments may tend to open up additional leakage which was not apparent before the treatment because most such treatments break the surface skin on the casting.

In some cases, it may be necessary to re-impregnate after applying the protective coating treatment. This may be done when Alumilite* treatments are applied to aluminum alloy castings or when AMC treatment A is applied to magnesium alloy castings. Impregnation with sodium silicate should not be applied to aluminum alloy castings after application of Alrok* coating because the impregnating solution destroys the coating.

If a large amount of additional leakage results from the application of one of these treatments, it may be avoided by giving the castings a light etch prior to impregnation. A slight amount of etching will open the leakage which is closed by a small amount of surface metal and permit penetration of the impregnant. Aluminum alloy castings may be etched in dilute sodium hydroxide solutions. Magnesium castings may be etched lightly in a solution containing eight parts of concentrated nitric acid, two parts of concentrated sulfuric acid, and 90 parts water at room temperature. Thorough washing is necessary after these etching treatments.

Effect of Baking Process

The baking or setting step during the process of impregnation may have an effect on the mechanical properties of both magnesium and aluminum alloy castings. Since the effect of heating cycles may be cumulative, care must be exercised in the selection of the baking process. In general, solution heat treated castings are most sensitive to the effects of reheating.

In the case of aluminum alloy castings, a maximum baking temperature of two hours at 250 F will not substantially affect the properties of solution-heat-treated and quenched castings. Although the effect of the baking of impregnants will have a smaller effect on the properties of artificially-aged aluminum alloy castings, the additional aging during the baking should be taken into account.

It is often possible to combine the artificial aging and sodium silicate baking of aluminum alloy castings.

*Patented process owned by Aluminum Company of America.

This procedure avoids any change in mechanical properties and provides a more economical treatment. The mechanical properties of solution-heat-treated magnesium alloy castings will not be affected by baking within a range of 6 hr at 275 F to one hour at 350 F. In general, as-cast and solution-heat-treated and artificially-aged magnesium alloy castings may be reheated to a maximum of 400 F without affecting the properties.

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DISCUSSION

Chairman: R. E. Ward, Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N.J.

Co-Chairman: W. Mader, Oberdorfer Foundries, Syracuse, N.Y.

Chairman Mader: Impregnation of aluminum and magnesium castings is a relatively common procedure due to their tendency towards micro-shrinkage and micro-porosity because of their low specific gravity. It is a recognized procedure to reduce leakage of castings in these light alloys. Impregnation should not be considered a salvage operation. Many people have gotten into trouble trying to salvage castings with shrinks and other defects in them.

Impregnation is a costly operation involving much material handling and investment in expensive autoclaves. In Mr. Blackmun's paper he says, "The usual pressures are employed for testing range from 10 to 40 psi. Occasionally pressures as high as 90 psi have been applied but experience has shown the lower pressures are as effective as the higher pressures." We make aluminum castings that must withstand pressures of 700 to 800 psi in service. These castings should be pressure tested at the pressure they are supposed to withstand in service and not at some lower pressure.

The author states that sodium silicate is a commonly accepted impregnant. There are other possible impregnants but sodium silicate performs satisfactorily. It is economical and could be used to good advantage.

Another use for impregnants is as a coating against corrosion. Sometimes it is hard to aluminize or anodize a casting, particularly with internal cavities, and such plastic impregnants as styrene, could be used to withstand corrosion and cavitation and certain other conditions.

Member: I would like to ask if the sodium silicate referred to is commercially pure sodium silicate or some mixture commonly sold on the market? There are two or three different brands of mixtures that contain sodium silicate.

Mr. Blackmun: The solution we used is a ready-mixed solution having a silica to sodium oxide ratio of approximately 3½ to 1. The reasons for the high silica ratio are fairly obvious, as you do not want a highly alkaline sodium silicate solution. You may get into difficulties with some actual etching or chemical attack on aluminum casting if a low silica ratio solution is used. The actual composition of this ready-mixed solution is 27 to 29 per cent silica, 8 to 9 per cent sodium oxide, and small amounts of other oxides of iron and calcium, magnesium sulphate, and sodium chloride. The total of these impurities probably should not exceed about 2 per cent.

Water makes up the balance. This solution has a gravity of about 39 to 41° Baumé. We have found that this solution is quite easy to obtain from a number of the chemical companies that make silicates. They seem to be willing to prepare this composition if they do not have the commercial product available.

Member: What is the nature of the leaks you have in the castings?

Mr. Blackmun: Generally leakage in aluminum or magnesium alloy castings is due to shrinkage. Shrinkage porosity, which is interconnected sufficiently to permit the passage of air or solution through the wall of the casting is the primary cause of leakages. I do not believe basically there is any other defect that you can directly connect with leakage, except possibly dross or oxide films.

Member: How effective is impregnation when you have dross or oxide?

Mr. Blackmun: Impregnation methods are not too reliable when leakage occurs through oxide films. That is, there seems to be a great deal of variation in the behavior of leakage through oxide films or leakage associated with oxide films. We are inclined to avoid impregnation of that type leakage. Before you even get to an impregnation step you find quite erratic behavior from the standpoint of pressure testing when the leakage is associated with dross or oxide films.

Chairman Mader: Oxide skins or dross inclusions cause fissures in the casting. Heat may cause expansion or contraction and will open up these fissures and you will have leakage even after impregnation. I think it should be a standard practice where you have x-ray facilities to see what the defect is before you impregnate the castings. Often it is possible that you may impregnate the castings and still lose them because the defect is dross. You will have trouble later on, especially if you machine the casting in the area where the leakage occurs.

M. H. Gould[1]: Styrene resin is often baked 2 hr. at 325° F. What would happen to this material in the case of service that involved temperatures of around 300° F.? Would a styrene resin stand up under these conditions or would it eventually break down?

Mr. Blackmun: You reach complete polymerization of that type of material in about 2 hr. at 350° F. From its nature I would expect that continuous exposure at temperatures of that order would probably tend to make it become somewhat brittle. I do not know that that involves any complications in service, however, unless the leak through the casting is so large that perhaps it gets so brittle that it will break up. Leakage after impregnation might develop later on.

Chairman Mader: Styrene impregnants can polymerize at lower temperatures and in fact that added catalyst may polymerize even at room temperature. That is one of the things you must watch out for. If you let the impregnant stand around it may thicken up and eventually you will have a mass of solid impregnant.

J. J. Brown[2]: Is there any pressure range beyond which impregnation is effective or is it effective at all pressures?

Mr. Blackmun: I do not believe that the pressure range is the important factor. The nature of the leak and type of defect which causes the leak are more important from that standpoint. I see no reason to believe that an impregnation of a casting would have any greater tendency to break down at high pressure than it would at low pressure. If the walls of the casting are such that you get some deformation under high pressure, however, you might break open some leakage in service or in pressure testing. I do not believe that pressure considerations are necessarily tied in with the impregnating material.

Mr. Brown: In other words, if you had a casting which had to maintain 800 pounds and you get a leakage, the impregnation would be just as effective as though it only had to maintain 40 pounds, is that right?

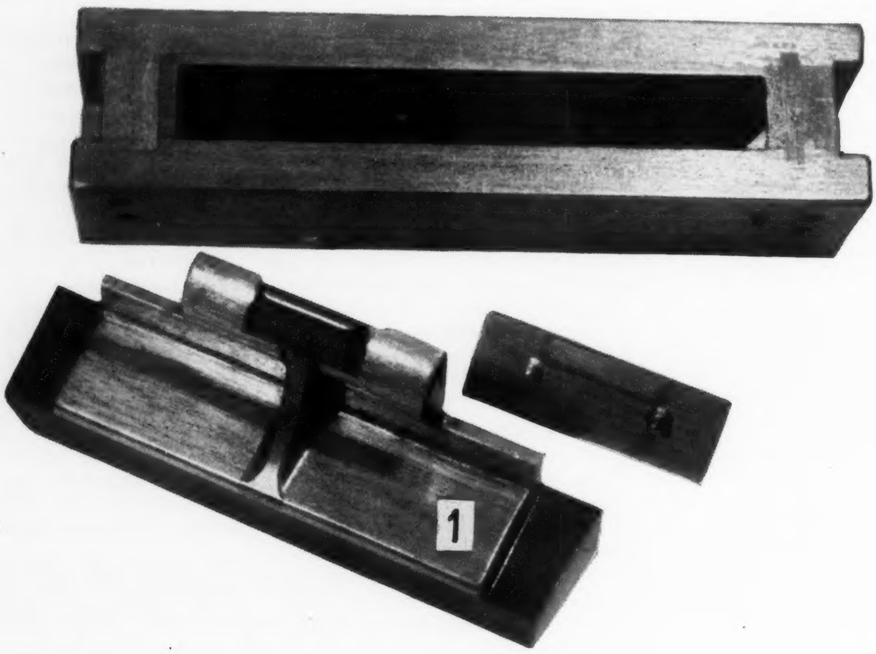
Mr. Blackmun: I think that is true. At the same time, it is also true that it is more difficult to impregnate severe leakage in a casting that is going to be used at that higher pressure than to impregnate a casting that is going to be used at a lower pressure.

[1] Aluminum Co. of America, Fairfield, Conn.
[2] Edw. S. Christiansen Co., Chicago.

1947 APPRENTICE CONTEST

Pattern Division Entries Take Many Forms

L. F. Tucker
Vice-Chairman
A.F.A. Pattern Division

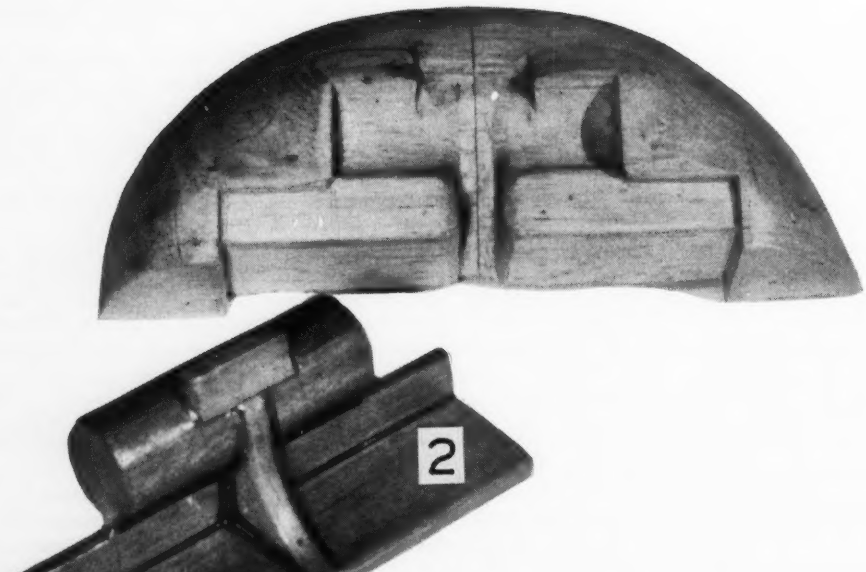


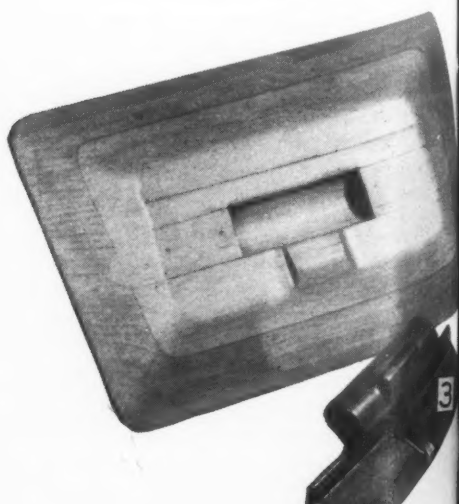
In comparison to other years, the design of the part submitted to the contestants in the Pattern Division of the 1947 A.F.A. Annual Apprentice Contest was comparatively simple from the molding and the construction points of view.

The chief molding problem was the curved face which prevents the pattern from being drawn from the mold without coping down, coring or straightening this surface. All three methods were used by the contestants. About the only construction problem was the decision as to whether to use leather fillets or carve them, and the contestants employed both methods.

In selecting the contest winners, the judges considered accuracy (35 per cent), moldability (35 per

Fig. 1.—First prize pattern has loose piece and simple core box. Fig. 2—Pattern with follow board awarded second prize. Fig. 3—Third place pattern also requires no core and uses follow board.





cent), workmanship (20 per cent) and time (10 per cent). The most interesting aspect of the patterns, and very important from an industrial point of view, is the moldability of a pattern. While the patterns to be discussed varied in other respects also, each illustrates a different molding method and this will be emphasized. Those pictured are representative of basic types and are the best examples of the many variations submitted.

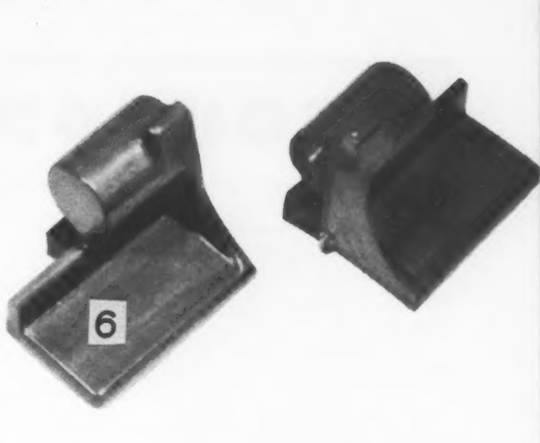
Curved Surface

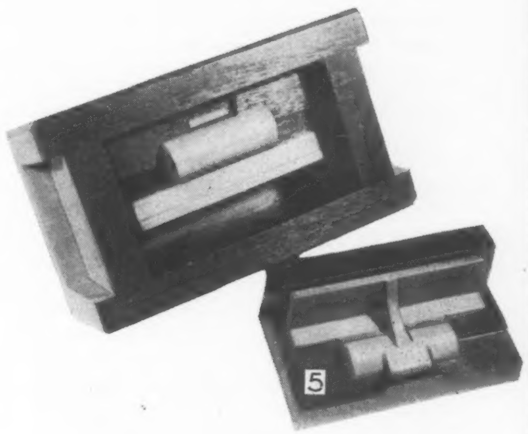
Inasmuch as there was no indication on the drawing submitted to the contestants to allow for the machining of the curved surface, the judges felt that this face should be cast as shown. In their opinion, the entry shown in Fig. 1 was the simplest method of accomplishing this, with the boss in the cope loose. It presents practically a flat back. The core is plain and requires no matching of parts between it and the pattern. This entry, made by William Waddicor, Jr., Brown & Sharpe Mfg. Co., Providence, was awarded first prize. Second place winner in 1943, Waddicor re-entered the contest this year, resuming his apprenticeship after serving in the armed forces.

Figure 2 shows a green sand method. No cores are used, but a follow board or match is provided and the curved surface is cast as called for by the blueprint. Howard J. Rand, Aluminum Co. of America, submitted this entry and received second prize for it. While this pattern requires no core and produces the curved surface as shown, it necessitates a rather deep lift in the cope. Nevertheless, the judges felt that some foundries might prefer this method of molding.

Figure 3 shows a pattern requiring no core, and again a follow board or match was provided. The difference between this and Fig. 2 is that the curved face was straightened, eliminating the necessity of a deep cope. This pattern, made by Laurent Messier, Acme Pattern & Woodwork Co., Ltd., Montreal, won third place. Scores for second and third place were only one point apart, the second place winner rating higher in accuracy.

Fig. 4—Pattern showing core set in cope at an angle. Fig. 5—This pattern shows cope and curved surfaces cored. Fig. 6—Pattern presenting a difficult gating job. This was the least practical method submitted.





Other Pattern Types

The order of discussion of the remaining three patterns shown bears no relation to their rating in the apprentice contest.

Figure 4 shows the cope cored with the core at an angle to enable the curved face to be drawn with a minimum of straightening. To obtain a clean casting, free of fins, the core must be made to match the mold cavity perfectly.

Figure 5 shows the cope and the curved surfaces cored and is an example of how a comparatively simple job may be made quite complicated. In order to obtain a radius on both sides of the horizontal flange, the contestant split the flange, putting one-half in the core. Not only does this almost double the time required to make the pattern, but the pattern and the core must match perfectly to produce a clean-looking casting.

Impractical Method

The least practical of all methods submitted is shown in Fig. 6. A core is used between the pads and the cope has to close down over one-half of its length. This pattern also presents a rather difficult gating job for the molder, and the need for draft prevents the curved surface from being cast flat lengthwise.

The 1947 contest again emphasizes the need of choosing the simplest molding method consistent with good foundry practice. The workmanship as a whole was very good, the judges being of the opinion that leather fillets properly applied were as acceptable as those carved. While the types of core boxes used were very simple, construction was good, and in most cases draft was ample which is very important in a dump type core box.

Sand Handbook Revision

The Fifth Edition (1944) of the FOUNDRY SAND TESTING HANDBOOK is now undergoing revision. Anyone desiring to contribute suggestions, corrections, omissions, or other constructive criticism of the present edition is invited to send such suggestions in duplicate to Dr. H. Ries, *Chairman*, A.F.A. Sand Division, Cornell University, Ithaca, N.Y. Your cooperation will make this book even more helpful as a manual of procedures for the foundry sand technician who looks to it for guidance.

FOUNDRY PERSONALITIES

J. A. Wotherspoon has organized his own foundry firm which will be known as J. A. Wotherspoon & Son Ltd. Situated in Oakville, Ont., the plant will produce soil pipe and fittings.

Mr. Wotherspoon served as Chairman of the Ontario chapter during 1946-47.

F. W. Klatt has been elected president of W. W. Sly Mfg. Co., Cleveland. Mr. Klatt retired from business activities in 1939 after representing General Motors Corporation in India and contiguous countries for 12 years. Prior to his joining GMC he served as general manager with the Sly company from 1921-27.

Mr. Klatt succeeds the late S. C. Vessy as president. Mr. Vessy died in 1946.

T. W. Bassett, Montreal, has been appointed chairman of the board; **M. Milne Todd,** Galt, president; **J. J. McFayden,** Galt, vice-president and general manager; **N. W. Zinn,** Galt, secretary-treasurer; and **Dr. W. W. Wright,** Toronto, director; for the Galt Malleable Iron Co., Ltd., Galt, Ont. The election of officers was necessitated by the death of H. J. Bassett, former president and general manager.

Mr. McFayden is a past Chairman of the Ontario chapter and has been prominent in many A.F.A. activities.

E. B. Cleborne has been elected executive vice-president by the board of directors of the Allegheny Ludlum Steel Corporation to fill the vacancy created by the death of William A. Givens. Mr. Cleborne, who has been president of Wallingford Steel Company, a subsidiary, since 1925, become vice-president and director of the old Ludlum Steel Company when that organization took over the Wallingford assets ten years later. He retained his posts when Ludlum and Allegheny Steel Company merged in 1938.

J. H. Keating was elected vice-president in charge of manufacturing at a recent meeting of the board of directors, Monarch Aluminum Mfg. Co., Cleveland. Mr. Keating joined Monarch in 1929 as foreman of the polishing department. Since that time he has been responsible for a continuing plant-wide program, developing automatic and semi-automatic machinery for every state of production of castings.

E. G. Bailey, vice-president, The Babcock & Wilcox Co., New York, has been elected national president, American Society of Mechanical Engineers. He will assume office at the end of the 1947 Annual Meeting, to be held in Atlantic City, December 1-5.

Four regional vice-presidents and three directors-at-large also were elected and will take office at the same time with the president. The regional vice-presidents are: **Frank M. Gunby,** Charles T. Main, Inc., Boston; **Paul B. Eaton,** Lafayette College, Easton, Pa.; **Thomas E. Purcell,** Duquesne Light Co., Pittsburgh; and **J. Calvin Brown,** J. Calvin Brown, Los Angeles.

Selected directors were: **J. B. Armitage,** Kearney & Trecker Corp., Milwaukee; **Abbott L. Penniman,** Consolidated Gas, Electric Light & Power Co., Baltimore; and **William M. Sheehan,** General Steel Castings Corp., Eddystone, Pa.

F. B. Diana, who recently resigned from the Whipple & Choate Co., Bridgeport, Conn., has assumed the position of vice-president and general manager, Z. Wagman & Son Ltd., Toronto, Ont., Canada.

Charles Mahoney, well-known throughout the metal industry as a metallurgist and industrial counsellor, has been elected vice-president and a director, William H. Bingham Co., Chicago.

R. W. Schroeder

Charles Mahoney

Roy W. Schroeder, started the fall term at the Navy Pier Branch, University of Illinois, Chicago, as laboratory instructor in foundry practice and patternmaking. Combining a long industrial and educational background, he has worked in a number of foundries in Galena, Rockford and Chicago and has taught at the University of Illinois, Urbana and Lewis Institute, Crane Technical high school and Washburne Trade school, all of Chicago.

Long active in A.F.A. work, he started the first chapter of the Junior Foundrymen of America while at Crane and is currently serving as Chairman of the Apprentice Contest Committee.

H. M. Reed has been elected secretary, Vanadium-Alloys Steel Co., Latrobe, Pa. He succeeds the late Fred P. Underwood.

Mr. Reed has been associated with Vanadium-Alloys since 1925.

Lance H. Cooper, London, England, a staff member, The Mond Nickel Company for 20 years and one of its Delegate Directors since 1945, has been elected an assistant secretary and assistant treasurer of the International Nickel Co. of Canada, Ltd.

Dr. Churchill Eisenhart has been given the post of head, statistical engineering laboratory, national applied mathematics laboratories, National Bureau of Standards, Washington, D.C. Dr. Eisenhart is noted for his work in mathematical statistics and its applications to industry and engineering. Received his Bachelor of Arts degree from Princeton University in 1934, his Masters degree in 1935, and his doctorate in mathematical statistics from the University of London in 1937.

Clinton D. St. Clair has been appointed works manager, Lunkenheimer Co., Cincinnati. Mr. St. Clair was vice-president and works manager, Hancock Div., Manning, Maxwell & Moore, Inc. In his new capacity he will have charge of all manufacturing operations at both the Fairmount and Carthage plants.

J. Paul Thibault, general manager, La Fonderie De L'Islet Ltee., L'Islet Station, Que., was a recent visitor to the A.F.A. National Office.

Dr. Joseph Koritta, foundry manager, Czechoslovak Metal & Engineering Works, Prague, and Ondrej Starosta, assistant to technical manager, Jawa Foundry, Ostrava-Zabreh, were recent A.F.A. visitors. They are in this country visiting foundries and equipment manufacturers.

These men are also acting as unofficial representatives of the Czechoslovak Foundrymen's Association which will sponsor the International Foundry Congress in Prague in 1948. For this Congress, papers by American authors on the following subjects are solicited: mechanization and foundry layout, foundry education, precision investment casting, knockoff risers, job evaluation and time study, high temperature sand testing and safety and hygiene.

John E. Payne, formerly manager of industrial sales, has been named manager of all industry sales departments for the Westinghouse Electric Corp. **R. S. Kersh,** who has been manager of the company's Houston office since 1942, was named manager of industrial sales to succeed Mr. Payne. Both men will be located at the East Pittsburgh, Pa., plant.

J. A. Havnen is now assistant foundry superintendent, Wells Mfg. Co., Skokie, Ill. He recently left Flour City Ornamental Iron Co., Minneapolis, where he had been foundry superintendent since being discharged from the Army. He was formerly associated with Lynchburg Foundry Co., Lynchburg, Va.

Mr. Havnen is currently serving as Secretary, Apprentice Contest Committee.

M. E. Neil has been appointed general sales manager of Mid-States Equipment Corp., Chicago. He will direct an expanded distribution program of the firm's welders.

G. Edward Conn., Jr., has been named manager of the Allis-Chalmers branch office at York, Pa. **MacGregor G. Jones,** former resident representative at the Allis-Chalmers Harrisburg branch office, which

has been discontinued, will assist Mr. Conn at York as sales representative.

Mr. Conn is an electrical engineering graduate, Drexel Institute of Technology and has been associated with Allis-Chalmers since 1940.

Albert S. Cahn has been appointed executive officer of the Institute of Numerical Analysis recently established by the National Bureau of Standards, Washington 25, D.C. Mr. Cahn has a wide range of experience in the mathematics of nuclear physics. He received his Bachelor of Arts degree from the University of Kansas City in 1939 and subsequently did graduate work in mathematics at the University of Chicago.

Charles T. Bragg will teach engineering at Boise Junior College, Boise, Idaho, this fall, the school officials announced recently. Mr. Bragg was formerly associated with Wayne University, Detroit and previously taught at Purdue University, Lafayette, Ind.

Wayne E. Martin, formerly sales managen, Beryllium Corp. of America, is now associated with William F. Jobbins, Inc., Aurora, Ill., as Cleveland sales representative. Mr. Martin's territory includes all of Northern Ohio and the Eastern seaboard states. He will also act as development engineer in marketing a new casting alloy.

Mr. Martin has had much experience in aluminum and other non-ferrous metals, and formerly was associated with General Bronze Corp., Sperry Gyroscope Co., Inc., and National Smelting Co., as metallurgical engineer.

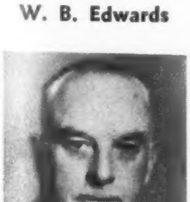
He has served on a number of A.F.A. committees; primarily aluminum and magnesium groups.

R. W. Kise, sales and application engineer with the Industrial Heating Division of General Electric Co., was recently named manager of sales of the industrial heaters and devices section.

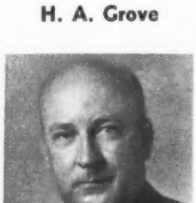
H. A. Grove has joined the Atlantic Steel Co., Atlanta, Ga., as metallurgical engineer. Mr. Grove comes to Atlantic from Republic Steel which he joined in 1933 as a member of the research department.

Winthrop B. Edwards has been named manager, Otis Elevator Company's plant in Yonkers, N.Y., succeeding John H. Hornung. The change is effective December 1, on retirement of Mr. Hornung after 47 years with the company, the past nine as manager at Yonkers. His successor has been with Otis 43 years. Mr. Edwards, since the end of the war, has held the post of manager of the Otis company's facilities division, and he just completed the consolidation of facilities and production of the Otis Buffalo works with the plants at Harrison, N.J. and Yonkers.

W. B. Edwards



H. A. Grove



Thomas J. Desmond is now sales manager for heavy chemicals, Grasselli Chemicals department, Wilmington 98, Del. **Henry H. Wolf** was also named manager, sales planning section.

Mr. Desmond joined the Du Pont Company in 1935 as a chemist at the Grasselli, N.J. works. He advanced to technical sales representative in 1943; in 1944 was transferred to the Milwaukee sales office and in 1946 to Minneapolis.

Mr. Wolf began work as a clerk in the Grasselli Chemical Company's Newark office in 1924. From 1929-39, he was in the Grasselli sales office in New York. He was transferred to Wilmington in 1939 as assistant sales manager for heavy chemicals.

Willard Jones

Mr. Jones has charge of the Ontario chapter's foundry fundamentals course this year. *(See p. 91, October AMERICAN FOUNDRYMAN).*

Richard W. Heine has been given the position of foundry instructor, University of Wisconsin, Madison, starting with the fall term. Graduate and holder of a master's degree from Wayne University, Detroit, he formerly taught metallurgy at General Motors Institute, Flint.

Dr. Arnold N. Lowan has been made chief, computation laboratory, National Bureau of Standards. This laboratory is one of the four units making up the newly established national applied mathematics laboratories. Born in Jassy, Roumania, in 1898, Dr. Lowan received his degree in chemical engineering from Polytechnic Institute of Bucharest in 1924, his Masters degree from New York University in 1929 and his doctorate from Columbia University in 1934.

J. M. Johnson, associated with Automatic Transportation Co., Chicago, since 1941, has been appointed assistant sales manager. He was formerly in charge of sales for the Transformer division.

C. D. Elliott has joined the Herbrand Division of Birmingham Stamping Co., as assistant to the manager. Formerly associated with Federal Electric Co., Chicago, and Chefford Master Mfg. Co., Fairfield, Ill., Mr. Elliott has an extensive background in the foundry, drop forging, and metal stamping fields.

S. E. Denno

S. E. Denno has been appointed sales engineer for Michigan and Northern Indiana by The Buckeye Products Co., Cincinnati. A native of Buchanan, Mich., Mr. Denno became affiliated with the Clark Equipment Company thirteen years ago. He started in the pattern shop and was later placed in charge of all sand control. Prior to assuming his present position he was responsible for the requisitioning of all materials and supplies for the foundry.

Irving A. Denison has been placed as chief, underground corrosion section, National Bureau of Standards. Dr. Denison will direct fundamental studies of underground corrosion utilizing the data from extended field tests. Dr. Denison obtained his Bachelor of Science degree from the University of Illinois in 1920, his Master's degree the following year from the same institution, and his doctorate from the George Washington University in 1929.

Glenn E. Hilliard and **Robert T. Eakin** are the recipients of the Allegheny Ludlum Merit award, consisting of the president's medal, a citation and $1,000 in cash.

Mr. Hilliard won his award for developing techniques for using oxygen as a carbon reduction agent in open hearth steelmaking. He is manager of Allegheny Ludlum's Brackenridge, Pa., plant open hearth department.

Eakin, plant manager, Carbide Alloys Div., Detroit (Ferndale), was given his prize for his work with Joy Mfg. Co. in the development of coal mining bits tipped with sintered carbide, thereby increasing production of machine mined coal.

David B. Hill has been appointed district field engineer, Atlanta field office, Chain Belt Co., Milwaukee. Previously he had an application engineer in the company's conveyor division at Milwaukee. He joined the organization in 1937.

At the annual meeting of the Alloy Casting Institute in Hot Springs, Va., the following officers were elected: President, **Paul G. Lutz,** vice-president and general manager, Standard Alloy Co., Inc., Cleveland; Vice-President, **W. B. Sullivan,** manager of alloy sales, Lebanon Steel Foundry, Lebanon, Pa.; Executive Secretary and Treasurer, **E. A. Schoefer, Alloy Casting Institute;**

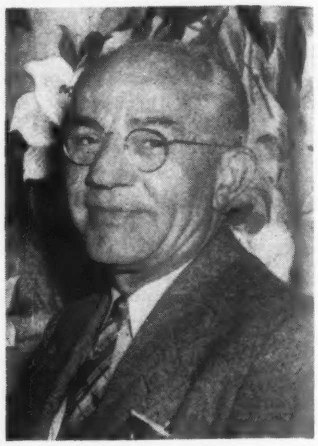
(Continued on Page 83)

CHAPTER OFFICERS

W. T. Bland
Commercial Steel Casting Co.
Marion, Ohio
Director
Central Ohio Chapter

H. E. Mandel
Pennsylvania Foundry Supply &
Sand Co.
Philadelphia
Director
Philadelphia Chapter

Thomas Bellsnyder
Jefferson Foundry Co.
Birmingham
Director
Birmingham District Chapter



P. E. Retzlaff
Busch-Sulzer Bros.
Diesel Engrg. Co.
St. Louis, Mo.
Secretary
St. Louis District Chapter

E. M. Sauza
Fundiciones y Talleres America, S.A.
Mexico, D.F.
Vice-President
Mexico City Chapter

W. B. George
R. Lavin & Sons, Inc.
Chicago
Director
Chicago Chapter

Rene Belisle
J. A. Gosselin, Ltd.
Drummondville, Que.
Director
E. Canada & Newfoundland Chapter

W. Ziegelmueller
Electric Steel Castings Co.
Indianapolis
Chairman
Central Indiana Chapter

R. C. Wood
Minneapolis Electric Steel Castings
Co.
Minneapolis, Minn.
Director
Twin City Chapter

W. G. Parker
Elmira Foundry Co.
Elmira, N.Y.
Director
Central New York Chapter

L. A. Cline
Saginaw Foundries Co.
Saginaw, Mich.
Director
Saginaw Valley Chapter

A. E. Rhoads
Engineering Castings, Inc.
Marshall, Mich.
Director
Central Michigan Chapter

FOUNDRY FIRM FACTS

Mr. Greenberg's Sons, San Francisco, is observing its 94th year of operation. The modernized brass and bronze foundry and machine works is exceeding pre-war figures at the rate of a million dollars a year, S. N. Greenberg, president and manager, has announced. A major product is the "California type" fire hydrant, developed by the firm, which is being manufactured in quantity for the Philippine Islands and the city of San Francisco. Some of the latter will replace others installed by the company's founder, Morris Greenberg, who came to America from France in 1851.

Toward proving that "the foundry is a GOOD place to work," the company has undertaken modernization of its facilities along with expansion; and has recently adopted a pension and insurance plan for employes. The system provides retired employes with a life-time income and a paid-up insurance policy. Service with the company is recognized, also. Those with five years receive a gold pin in the design of a fire hydrant: the pin is set with a ruby for ten years; an emerald for 15, and a diamond for 20

Bridgman (Mich.) **Castings, Inc.,** has purchased the plant and equipment of **Mathieu Foundry, Inc.,** of Bridgman, and has announced appointment of Arthur C. Mathieu as superintendent.

The Whiting, Ind., plant of **Federated Metals Div., American Smelting & Refining Co.,** was host to a group of Purdue University engineering students recently. Professor I. N. Goff was in charge of the student group and A. S. Wigle, plant superintendent, represented the company. Students toured the non-ferrous plant and studied production methods in the manufacture of brass and bronze ingot, solder, type metal, babbitt, and die casting and lead-base alloys. The tour was sponsored by the company in line with its policy of fostering the interest of educational groups in the technology and development of non-ferrous metals.

American Standards Testing Bureau, Inc., was organized recently at 44 Trinity Place, New York. The firm will sample, test and certify materials and products for consumers, distributors and producers. It was established as an independent agency to permit expansion of testing and quality control services formerly rendered by Sam Tour & Co., Inc.

The **F. K. Simonds Co.** foundry at Berkeley, Calif., a subsidiary of Armco Drainage & Metal Co., was heavily damaged by fire recently.

Metalloy Foundry Co. has been organized at Hudson, Mich., and will build a new factory there for the production of aluminum, brass and bronze castings. Officers of the firm are Nelson Berlin, president; Charles Gibbons, vice president, and Richard Berlin, secretary-treasurer. The company was formerly located at Pittsford and operated under the name of **Pittsford Aluminum Foundry.**

The Morris Bean & Co., Yellow Springs, Ohio, have poured the biggest and heaviest single aluminum casting ever made in plaster (see cut below). It is to be used by the Goodyear Tire & Rubber Co., Akron, for earthmover tires—the largest tire this company has ever scheduled for production.

The casting is 95 in. in diameter and the casting weighed 2200 lb.

The new foundry of **General Machine Co.** at Emmaus, Pa., has been completed and has begun operations. Approximately 60 per cent of production will be in general jobbing, the balance will be in castings for the parent company's coal stoker, oil burner and deep freeze units.

Fremont (Ohio) **Foundry Co.** has launched an employe housing building project. The homes will be located on the company's new addition, and will comprise 30 units.

Conde Foundries, Inc., Oneida, N.Y., has announced a change in firm name to **Oneida Foundries, Inc.** The company recently occupied new offices at **147 Main St.,** where W. O. Smith, president, is in charge. There is no change in ownership.

Air Reduction Sales Co., New York, has opened a new acetylene plant at Dayton, Ohio. R. K. Haygood is superintendent.

Case Institute of Technology, Cleveland, has established a new **Research Laboratory for Mechanical Metallurgy** on the recently constructed third floor of the Rockefeller Metallurgical Engineering Building. An outgrowth of the demands of war-time research by the Case department of metallurgical engineering, the new laboratory will supplement that departments facilities and will be utilized for instructional and for sponsored investigational purposes. Among groups for which research and development projects are being conducted in the new laboratory are the Army Ordnance Department, Office of Naval Research, National Advisory Committee for Aeronautics and the National Research Council. Problems include metal casting, heat treatment of steels, analysis of metal forming and joining processes and of stress and strain, and flow and fracture of metals.

Induction Heating Corp., has moved to new quarters at 181 Wythe Ave., Brooklyn 11. The new location provides more than twice the area of the former plant, and all departments have been expanded. Research on customer production problems and new applications of induction and dielectric heating will be carried on in an enlarged and fully-equipped laboratory.

Jefferds & Moore, 422 Professional Bldg., Charleston, W. Va., and Wilbur S. Ball, 1047 Starks Building, Louisville, Ky., have been named distributors of the electrical industrial trucks of Automatic Transportation Co., Chicago.

Federated Metals Div., American Smelting & Refining Co., recently placed in operation its new Los Angeles plant for the production of intermediate zinc. Built at a cost of nearly two-hundred thousand dollars, the new facility incorporates improved smelting furnaces, using horizontal type retorts, and latest handling equipment. It is designed to round out the company service to the West Coast.

Midwest Ferro-Therm Distributors, has been organized at 9 S. Clinton St., Chicago, to handle distribution of the steel insulation manufactured by **American Flange & Mfg. Co.** in the midwest and central states. W. J. Donahoe is president of the new firm, which will cover Illinois, Indiana, Kentucky, Missouri, Iowa, Wisconsin, and Minnesota.

Sheffield (Ala.) **Iron & Steel Co.** wholly-owned subsidiary of **Barium Steel Corp.,** has purchased the plant and all physical assets of **George King Co., Inc.,** Sheffield. The foundry has been placed under the direction of S. T. Jazwinski, vice president. A modernization program is planned.

Rust Furnace Co., Pittsburgh, Pa., has contracted for the reconstruction of two billet heating furnaces at the Joliet, Ill., works of American Steel & Wire Co.

Azusa Iron Foundry was recently established at 825 N. Loren, Azusa, Calif., and will manufacture pipe fittings. George R. Paul is owner of the firm, which formerly operated in Los Angeles under the name of Paul-O-Cast Co.

NEW FOUNDRY LITERATURE

Air Reduction Sales Company has announced a 22-page, dual purpose catalog which lists and explains the complete line of Airco acetylene generators both stationary and portable. The advantages of each are outlined. The catalog also describes manifolds both oxygen and acetylene. Write to the above company for copies at 60 East 42nd St., New York 17.

Specifications and pictures of the complete line of Severance midget mills are presented in the "Faster Finishing" catalog No. 16 now being distributed by Severance Tool Industries, Inc., Saginaw, Mich. Comprising 28 pages, the catalog contains information on the five principal tool types: midget mill deburring group; tube cutter group; countersink group and miscellaneous. Tables of recommended cutting speeds are also included.

Eastern foundries attempting to obtain surplus government property should write to the New York Regional Office (Region 2), 37 Broadway, New York 6, and ask to be placed on the mailing list to receive booklets which are published periodically describing foundry equipment that is available.

Amply illustrated 8-page catalog on lifting magnets issued by the Ohio Electric Mfg. Co., 5900 Maurice Ave., Cleveland 4, gives detailed information on construction features of magnets and magnet controllers, as well as sizes, capacities and applications for all models.

Reynolds Metals Co., Louisville, publishes a four-page leaflet to help keep metallurgists up-to-date on the latest methods for fabricating and processing aluminum and its alloys. Write and be placed on the mailing list to receive the *Technical Advisor*.

Revere Copper & Brass, Inc., 230 Park Ave., New York 17, has issued an interesting report to its employees in the form of a 20-page two color pamphlet. It contains the president's message and depicts in graph form how the organization spent its money.

Bulletin B-16 describes the Mine Safety Appliance front-type demand mask which is a self-contained breathing apparatus for short duration protection in gaseous or oxygen deficient atmospheres. Copies of the bulletin can be obtained by writing direct to Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8.

Facts that should be known about the American Wheelabrator & Equipment Corporation's sandcutter are produced in Catalog No. 25A. This 12-page illustrated booklet contains information on the types of cutters produced, partial list of users, features of construction, specifications and typical installations.

The above concern also publishes a quarterly *American Wheelabrator Digest* which is available upon request as is the catalog described above.

Hewitt-Robins, Inc., Passaic, N. J., through its Robins Conveyors Div., has issued Bulletin No. 129 describing and illustrating the Robins Eliptex Dewaterizer. This 4-page bulletin gives facts and cases demonstrating the ability of this method to remove surface moisture from coal and other materials in sizes as small as 1/8-in. x 0-in. The machine and method are described in detail. Address requests to Robins Conveyors Div., 270 Passaic Ave., Passaic, N.J.

Copies of "Allegheny Metal in the Meat Industry" may be obtained free on request from Allegheny Ludlum Steel Corp., 2020 Oliver Building, Pittsburgh, Pa. The booklet portrays stainless steel's role in the meat industry. The publication is colorfully printed and well illustrated.

A catalog produced to illustrate and describe the Eaton permanent mold machine is available from the Eaton Mfg. Co., Vassar, Mich. Machines are shown and a brief description of each is included.

The Mine Safety Appliances' Dust-Vue Microprojector, illustrated and shown in Bulletin No. CT-7, is designed to simplify the determination of numerical concentrations of impinger and precipitator dust samples. For more detailed information write to Mine Safety Appliances Co., Braddock, Thomas & Mead Sts., Pittsburgh 8, Pa., for this bulletin.

The latest edition of the Allis-Chalmers Annual Review has been published and for the first time in a number of years it is being offered for unlimited distribution. The 32-page booklet covers the numerous fields in which Allis-Chalmers products are being used.

A 12-page reprint of an article entitled "Flux-Injection Cutting of Stainless Steel" published recently by the trade press is being given gratis to persons writing the Air Reduction Co., 60 East 42nd St., New York 17. The article is profusely illustrated with photographs and diagrams.

To serve manufacturers seeking factory location sites in California, the California State Chamber of Commerce has completed and published a comprehensive guide to sources of information and service. The booklet, "Factory Location in California," will be furnished without cost upon application. Under headings of a manufacturing plant location survey outline, the report lists a complete bibliography of available studies and reference sources concerning industrial sites, labor supply and costs, living conditions and costs, market and distribution facilities, raw materials, power, fuel and water supply, transportation, tax and license laws, community industrial surveys and general economic surveys. Copies may be obtained free from the California State Chamber of Commerce, 350 Bush St., San Francisco 4.

The McKay Co., 322 McKay Building, Pittsburgh 22, announces the publication of its catalog which presents a complete line of shielded-arc electrodes for the welding of mild-steels and alloy-steels. This manual gives complete specifications, operating characteristics, mechanical properties, applications and other pertinent data on all types of McKay electrodes. A reference guide also makes it easy to find the exact electrode for every fabrication and maintenance welding application. A separate section devoted to electrodes for welding hardenable, low-alloy, high-tensile steels is included. The catalog contains a glossary of welding terms, conversion table, resume of welding faults and their prevention and other useful information.

Copies of Folder A-100 are now available from the Gas Machinery Co., 16120 Waterloo Road, Cleveland 10, which illustrates their complete line of industrial furnaces. Various furnace applications are also shown. Free on request.

The 1947 edition of "Products of Eaton" is off the press and illustrated a number of new Eaton developments, namely; the dynamic devices, including dynamometers, oil well draw works brakes and vehicle fan drives. Other products have been brought up to date, making this booklet a complete presentation of all Eaton products. Copies are available by writing to the Advertising Department, Eaton Mfg. Co., 739 East 140th St., Cleveland 10.

Anti-Corrosive Metal Products Co., Inc., has a new brief circular on stainless steel bowls, which combines technical information with consumer data. Copies free on request, address Anti-Corrosive, Castleton-on-Hudson, N.Y.

The Du Pont company describes a new method for polishing stainless steel in an operating manual. "Du Pont Electropolishing Solution." The technique, which makes use of a solution of glycolic acid, sulfuric acid, and water provides the metal finisher with a new method. Requests for the manual should be sent to E. I. duPont de Nemours & Co., Wilmington 98, Del.

Foundry Services, Inc., 280 Madison Ave., New York 16, is the address for those who wish to be placed on the mailing list to receive "Foundry Practice." It is sent free of charge to all interested parties and written for the practical man in the foundry to help him overcome his difficulties.

Air Reduction Sales Co., 60 East 42nd St., New York 17, recently published an eight page booklet telling the story of the growth of welding and allied processes in freight car construction. The same firm has released an article that covers the possibility of increasing production by firing oxygen with the regular fuel during the meltdown. Air Reduction has also published a 12-page booklet, illustrated by both photographs and diagrams, that covers a method of removing harmful gases from molten metals. This consists of bubbling a dry inert gas through the metal just before casting. Copies of these booklets may be obtained by writing Air Reduction Sales Co.

A completely revised edition of catalog No. 214-A which describes the wheelabrator swing table has been published by American Wheelabrator & Equipment Corp., 555 S. Byrkit St., Mishawaka, Ind. Detailed information on each of the five sizes including construction features, overall dimension drawings and specifications is contained in the 20-page catalog. Sections are devoted to operating performance facts, ventilating requirements, installation photographs, list of users and design variations available for handling special cleaning applications.

"Mellon Institute Enters the Postwar Era" is the name of a bulletin put out by Mellon Institute of Industrial Research, Pittsburgh 13, which contains a review of their 1946-47 research activities and accomplishments. Copies are available upon request.

The Foundry Div., Tamms Silica Co., 228 No. LaSalle St., Chicago 1, has just released a new six page, two color, illustrated broadside on their Super Tamastone Pattern Compound. Several unusual and interesting foundry applications of the product are listed. The literature also carried complete Tamastone specifications as well as information on pyramid skimmers, demountable frames, No. 100 core equipment cleaner; No. 90 iron oxide, metaline, patternseal, liquid parting, tamolene wax, plastic metal, modeling clay and layout dope. Available on request.

Sand blast hose, described as "extra-tough, yet highly flexible," is the subject of a four-page folder now being distributed by Hewitt Rubber, 240 Kensington Ave., Buffalo 5, N. Y., a division of Hewitt-Robins, Inc.

A 72-page blooklet covering electric salt bath heat treating and processing has been published by Ajax Electric Co., Inc., Philadelphia 23. Information is presented on the electrodynamic self-circulating principle of the Ajax-Hultgren furnace and its advantages; installation photos are included. Other sections are devoted to neutral hardening, isothermal processing (austempering and martempering), liquid carburizing, cyanide hardening and nitriding high speed steel, heat treating aluminum, annealing, descaling and cleaning, dip brazing, heating for forging, and tempering and coloring. Requests for this book should be made on firm letterhead.

Allis-Chalmers Mfg. Co., Milwaukee, reports in the firm's latest annual engineering review that significant progress in development and design work on most of the company's highly diversified lines of industrial products ranging from steel processing to precision casting, induction heating and betatron radiography for the metalworking industry. Review is available upon request.

A new technical pamphlet by Dow Corning Corp., Midland, Mich., describes the physical properties of DC Antifoam A, outlines various methods for using this silicone antifoam agent, presents the methods used for determining its efficiency and economy. Listed are also industries in which the product is used. Leaflet will be sent to all who request it.

Burrell Technical Supply Co., 1936 Fifth Ave., Pittsburgh 19, in their "Burrell Announcer of Scientific Equipment," No. 47-3-26, present detailed descriptions and drawings of an electric vacuum oven, balances, aquatrator, Dillon tester, electroanalysis apparatus, hot plates and a number of other items used in chemical and metallurgical laboratories. Available from the above company upon request.

20-page book "Wheelco Electronic Controls" has just been released. Wheelco measuring and control systems; the "electronic control principle," multronic proportioning, automatic positioning and program control are explained with graphs, diagrams and photographs. Millivoltmeter, potentiometer and resistance thermometer controllers are shown as well as indicating pyrometers and resistance thermometers, input controllers, portable pyrometers and selector switches.

Kaukauna Machine Corp., Kaukauna, Wis., has issued a 22-page bulletin illustrating their series 125 portable horizontal drilling and tapping machines and model 700 indexing table. Bulletin contains photographs and specifications and operational views of the various head positions with these machines. A copy of this bulletin will be sent when requested on company letterhead.

Complete information regarding the veritron electronic pyrometric controller which is manufactured by the Taco West Corp., 2620 South Park Ave., Chicago, is contained in Bulletin PC-1.

Oakite Products, Inc., 157 Thames St., New York, recently published two manuals that provide up-to-date information on the use of Oakite Soluble Oil in machining, cutting and grinding operations, and Oakite Special Protective Oil for temporary or semi-permanent rust protection of ferrous parts during operations or while in storage.

A 4-page leaflet relaying information on laboratory mixer, potassium lodide and slide comparators has been published by Burrell Technical Supply Co., 1942 Fifth Ave., Pittsburgh 19. Copies are available.

Copies of the spring issue of "The Wheelabrator Digest" are available from the American Wheelabrator & Equipment Corp., Mishawaka, Ind., upon request. Contains articles on cleaning room practice using wheelabrator products.

Ready for distribution is Bulletin No. 68 published by Silent Hoist & Crane Co., 841 63rd St., Brooklyn 20, N.Y. Description is given of the mobile swing-boom crane that operates on tracks and off tracks. The folder contains photographs, diagrams and specifications of the crane.

For use in outdoor applications, and other locations where adverse atmospheric conditions prevail, the Electric Controller & Mfg. Co., Cleveland 4, present a line of weather-proof safety switches in Bulletin 1300.

A fully illustrated catalog is now available from Newcomb-Detroit Co., 5741 Russell St., Detroit 11, in which they publish important data concerning their Uni-Wash Shake-Out Booth.

Pertinent information regarding the Limitron, a new automatic electronic inspection system is given in a folder published by Arma Corp., 254 36th St., Brooklyn, N. Y. How it works and what it does is explained through a series of photographs and diagrams.

A catalog has been published by Adolph I. Buehler covering testing equipment in the Amsler line. These include machines for universal testing, spring testing, combined stress fatigue testing, horizontal tensile testing, cold bent testing, ductility testing and the high frequency vibrophore. Copies can be obtained by writing Adolph I. Buehler, 228 N. LaSalle St., Chicago 1, or Canadian foundries can write to Sheppard Electrical Laboratories, Ottawa, Canada.

An illustrated bulletin describing a light handlift truck to handle one ton loads may be had on request from the Arcade Mfg. Div., Rockwell Mfg. Co., Freeport, Ill.

A 20-page, three color book, "Wheelco Electronic Controls," has been released by Wheelco Instruments Co., 847 W. Harrison St., Chicago 7. Measuring and control systems, the "electronic control principle," multronic, proportioning, automatic positioning and program control are explained with graphs, diagrams and photographs. Millivoltmeter, potentiometer and resistance thermometer controllers are shown as well as indicating pyrometers and resistance thermometers, input controllers, portable pyrometers and potentiometers, and electro switches. Combustion safeguards and auxiliary equipment are treated separately. A separate four page price list is included.

Synchro-Trol, a line of synchronous-precision, a-c resistance welding controls is described in a booklet (B-3839) published by the Westinghouse Electric Corp., P.O.

Box 868, Pittsburgh 30. The 18-page illustrated booklet also describes the company's line of nonsychronous controls, known as Weld-O-Timer.

Pacific Aviation, Inc., 9900 Lincoln Blvd., Los Angeles 45, has issued a two colored leaflet describing the "Hydromat" for drilling, milling, boring, tapping and turning. The outstanding features and the five standard models of the machine and among the things listed.

American Photocopy Equipment Co., 2849 N. Clark St., Chicago 14, lists in its latest bulletin the advantages of its "Apeco Photoexact." Copies of anything written, drawn, photographed or printed can be reproduced quickly, accurately and economically.

A catalog containing a list of approximately 200 standards covering safety and industrial health is now available to safety engineers and other interested persons from the American Standards Association, 70 East 45th St., New York 17. The 20-page booklet also gives a brief description of the standards contents.

A new catalog describing the Uni-Wash Shake-Out booth has been published by the Newcomb-Detroit Co., 5741 Russell St., Detroit 11. It contains illustrated descriptions of the construction and operation of the new dust arrestor along with complete specifications. Also included is the full description of the automatic damper. Copies are available without obligation from the above firm.

Hutchinson & Sons, 31 Stanhope Ave., Toronto 6, Canada, distributes the leaflet "Foundry Practice" which is written for the practical foundryman in the foundry to help him overcome his difficulties. Requests to be placed on the mailing lists will be promptly taken care of.

Information pertaining to the manufacture of several new lines, the redesigning of some items, the lowering of prices on certain instruments and accessories and the removal of the escalator clause is contained in an 8 page, two color bulletin released by the Wheelco Instruments Co., Chicago.

"Inco," published by International Nickel Co., Inc., 67 Wall St., New York 5, contains in the spring issue two short but interesting foundry articles dealing with salvaging of castings and the use of chaplets. Copies of the magazine are available from the above address.

The American Society of Tool Engineers, 1666 Penobscot Building, Detroit 26, has issued a concise, numerical, engineering index. The index comes in two parts, the numerical listing and alphabetical listing. The numerical listing is abridged but shows the basic structure and logic of the ASTE edition of the U. S. Standard Commodity Classification. The alphabetical listing is a cross reference index of the same numerical material expanded for specialized use.

A four page leaflet explaining the use of machine ground carbide burs for mold makers, tool room and die shop use has been issued by The Atrax Co., Francis & Day St., Newington 11, Conn. Specifications including the shape, diameter of cut and length of cut of these burs are listed.

A series of booklets describing the application of Wheelabrator airless abrasive blast cleaning equipment to gray iron, steel, malleable and non-ferrous foundries has been published by American Wheelabrator & Equipment Corp., 555 So. Byrkit St., Mishawaka, Ind. Each booklet deals with a specific type of industry. Case histories of problems solved are included to describe the performance and versatility of the equipment. Other interesting features of the booklets are illustrations of typical products cleaned, a description of the demonstration laboratory at Mishawaka for test cleaning of products, typical users of Wheelabrator equipment and sizes and types of equipment recommended for each industry. Copies of the booklets may be obtained by writing to American Wheelabrator & Equipment Corp.

Copies of a report which provides data on the cleaning and surface preparation of ferrous metals before organic finishing is available from Oakite Products, Inc., 22 Thames St., New York 6. This report gives full particulars of a special phosphate-type cleaning and conditioning treatment provided by Oakite Compound No. 36. A mildly acidic material which removes light oils, grease, shop dirt and light rust from ferrous metals prior to painting, this compound at the same time coats surfaces with a phosphate film to provide improved paint adhesion and resistance to corrosion should painted finishes become scratched or damaged.

A. P. Green Fire Brick Co., Mexico, Mo., has published a leaflet describing an observation port that permits the operator to observe furnace and grate conditions with no disturbance of the firing cycle and without exposure to heat or glare. Detailed drawings and specifications of the port are incorporated in the leaflet.

To help electrical engineers and fabricators pick the best possible magnetic materials for their purpose, Allegheny Ludlum Steel Corp. has issued a 32-page brochure. "Magnetic Materials" is designed to explain in simple fashion the basic functions of core materials. Diagrams and explanatory text show the comparative properties of the wide range of magnetic steels and alloys now being produced.

The Pyrometer Instrument Co., 103 LaFayette St., New York, have put out a new catalog No. 160 illustrating and describing in detail the surface pyrometer. This instrument was designed especially for the innumerable production and laboratory requirements for a quick and accurate method of determining surface and sub-surface temperatures. Copies available upon request.

In catalog 16, Severance Tool Industries, Inc., Saginaw, Mich., have placed a brief resume of additional standardized countersinks. Catalog is available upon request.

Hercules Powder Co., Wilmington, Del., has produced a folder which shows how to determine the minimum quantity of oil needed in each core mix to make good cores. Available upon request.

Oakite News Service, published by Oakite Products, Inc., 22 Thames St., New York 6, contains numerous articles which would interest foundrymen from both a technical and non-technical angle. Those interested in being placed on the mailing list should write to the above address.

Cash-Acme Bulletin 224 describes in complete detail the new type SY strainer. The S type strainer is also described in this 4-page folder. A list of all of the current Cash-Acme bulletins which have been issued are also shown. Bulletin is free and can be obtained by writing A. W. Cash Valve Mfg. Corp., Decatur 60, Ill.

The evolution of Caterpillar Tractor Co. and its products progress achieved to date and plans for future progress, are outlined in a newly published 12-page booklet titled "Caterpillar Progress Through the Years." Copies can be obtained by writing Caterpillar Tractor Co., Peoria 8, and requesting Form 10,000.

Comprehensive foundry dust control and ventilation are presented in the 32-page bulletin "Schneible in the Foundry Industry." This bulletin expounds the fact that the installation of dust and fume collectors in a foundry affords only partial alleviation of the detrimental effects of contaminated air on worker efficiency and production costs, and demonstrates why, to conform with sound engineering practice, a dust and fume collection system should embody certain principles. Bulletin 47 will be mailed upon request from Claude B. Schneible Co., 2827 Twenty-Fifth St., Detroit 16.

Bulletin A51 issued by The Atrax Co., 240 Day St., Newington 11, Conn., describes the $\frac{1}{8}$-in. carbide burrs as manufactured by the above concern. Copies available upon request.

Tentative specifications for corrosion-resisting chromium and chromium-nickel steel welding electrodes have been issued and these new specifications provide classification and test requirements for twenty-four classifications of electrodes. The classifications are grouped in six series covering the stainless steel types. Copies of the specifications in the form of a 13-page, 6 x 9 booklet may be obtained for twenty-five cents from the American Welding Society, 33 West 39th St., New York 18.

★ NEW A. F. A. MEMBERS ★

September 15 — October 15 — Conversions take the spotlight this month, six companies switching their type of Association affiliation. Last year one company made the company to sustaining change while this year a total of five are shown. Members will find an overall addition of 82 new foundrymen below as contributed by 26 A.F.A. chapters. Leading the field is Canton with 11, then St. Louis with 9 and Chicago 8.

CONVERSIONS—COMPANY TO SUSTAINING

Dominion Engineering Works, Ltd., Montreal, Que. **(G. E. Tait, Asst. Mgr.)

G. H. R. Foundry Co. Div., Dayton Malleable Iron Co., Dayton, Ohio **(W. J. MacNeill, Gen. Mgr.)

Dayton Malleable Iron Co., Dayton, Ohio. **(Anthony Haswell, President)

General Foundry & Mfg. Co., Flint, Mich. **(C. W. Bonbright, Pres.)

Moline Malleable Iron Co., St. Charles, Ill. **(R. R. Fauntleroy, Pres.)

CONVERSION—PERSONAL TO COMPANY

*West Coast Foundry & Mfg. Co., Los Angeles, Calif. **(A. N. Culp, Jr., Partner)**

BIRMINGHAM DISTRICT CHAPTER

Robert D. Champion, Fdry. Instructor, Alabama Foundry Co., Birmingham.
D. K. Crawford, Foreman, Stockham Pipe Fittings Co., Birmingham.
A. R. Doss, Time Study, Alabama Foundry Co., Birmingham.
Knox Riley, Met., U. S. Pipe & Foundry Co., Chattanooga, Tenn.

BRITISH COLUMBIA CHAPTER

Weston C. Catherall, Instr. Patternmaking, Vancouver Technical School, Vancouver.

CANTON DISTRICT CHAPTER

*Babcock & Wilcox Co., Wadsworth, Ohio. (George J. Hartnett, Jr., Supt. of Planning)
Geo. Baughman, Asst. Frm., The F. E. Myers & Bro. Co., Ashland, Ohio.
H. A. Biddinger, Asst. Frm. Pattern Shop, The F. E. Myers & Bro. Co., Ashland.
Clark Bright, Frm. C/R. The F. E. Myers & Bro. Co., Ashland.
H. K. Ganyard, Prod. Mgr., The F. E. Myers & Bro. Co., Ashland.
E. F. Kipp, Frm. Patt. Shop, The F. E. Myers & Bro. Co., Ashland.
Geo. C. Knapp, Frm Iron Frdy., The F. E. Myers & Bro. Co., Ashland.
Melvin Piper, Asst. Frm. Iron Fdry., The F. E. Myers & Bro. Co., Ashland.
E. O Rannels, Frm. Brass Fdry., The F. E. Myers & Bro. Co., Ashland.
F. Richard Wilson, Asst. Supt. The Deming Co., Salem, Ohio.
W. H. Zehner, Design Engr., The F. E. Myers Bro. Co., Ashland.

CENTRAL INDIANA CHAPTER

Keith D. Evans, Ass't. Training Dir., International Harvester Co., Indianapolis.
Clair Nye, Training Dir., International Harvester Co., Indianapolis.

CENTRAL OHIO

Charles P. Loucks, Eastern Clay Products, Jackson.

CHESAPEAKE CHAPTER

Vincent De Pierre, Met., U. S. Naval Gun Factory, Washington, D.C.
Samuel Weiss, Exec. Secy., American Coke & Coal Chemicals Institute, Washington, D.C.

CHICAGO CHAPTER

*Plastic Corp. of Chicago, Chicago. (Ladd Salach, Pres. & Gen. Mgr.)
Waldo E. Hikes, Gen. Sls. Mgr., Plastic Corp. of Chicago.
W. M. Hofert, Jr., Asst. Wks. Met., International Harvester Co., Chicago.
Earl Jarm, L. A. Cohn & Bro. Inc., Chicago.
Charles W. Vodicka, Treas., Plastic Corp. of Chicago.
Stephen Walse, Process Engr.-Plastic Tech., Plastic Corp. of Chicago.
William C. Wilson, Engr., Lester B. Knight & Associates, Chicago.
Charles J. Zavadil, Gen. Shop Frm., Plastic Corp. of Chicago.

CINCINNATI CHAPTER

Marvin L. Steinbuch, Met., The Lunkenheimer Co., Cincinnati.

DETROIT CHAPTER

Joseph Balcerowiak, Frm. Detroit Gray Iron Foundry Co., Detroit.
Howard F. Faes., Sls. Engr., Chicago Retort & Fire Brick Co., Detroit.

E. CANADA & NEWFOUNDLAND CHAPTER

Marcel Bernard, Sand Lab. Oper., J. A. Gosselin Co. Ltd., Drummondville, Que.
Mrs. R. F. Browne, R. F. Browne, Mftrs. Agent, Montreal.
H. Russell Neville, Vice-Pres. & Mng. Dir., Manganese Steel Casting Ltd., Sherbrooke, Que.

METROPOLITAN CHAPTER

C. P. Walker, C. P. Walker & Son, Orange, N.J.
Robert W. Walker, C. P. Walker & Son, Orange.

* Company Membership
** Sustaining Member

MEXICO CHAPTER

Francisco Acosta, Owner, Valvulas Mexico, Mexico, D.F.

MICHIANA CHAPTER

Clifton M. Brooks, Supt. of Fdries, Covel Mfg. Co., Benton Harbor, Mich.

NORTHEASTERN OHIO CHAPTER

Louis F. Wind, Sls. Mgr., U. S. Reduction Co., Cleveland.

NORTHERN CALIFORNIA CHAPTER

Leon Robert Cameto, Jr., Exec., Production Foundry Co., Oakland.

NORTHWESTERN PENNSYLVANIA

Kenneth H. Chandley, Fdry. Prod. Mgr., Bucyrus Erie Co., Erie.
Robert L. Curtiss, Asst. to Gen. Supt., Bucyrus Erie Co., Erie.
F. H. Dillon, Bucyrus Erie Co., Erie.
Robert L. Johnson, Cupola Frm. Bucyrus Erie Co., Erie.
Harry J. Lewis, Fdry. Millwright Frm., Bucyrus Erie Co., Erie.
E. J. Messmer, Clerk, Bucyrus Erie Co., Erie.

ONTARIO CHAPTER

C. C. Carriss, Deve. Engr., Waterous Ltd., Brantford.
Graeme G. Ferrier, Met., Sully Fdry. Div., Neptune Meters Ltd., Long Branch.

OREGON CHAPTER

William Henry Albohn, Engr., Western Industrial Supply Co., Portland.

QUAD CITY CHAPTER

Russell S. Hoban, Prod. Mgr., Riverside Foundry, S & W Corp., Bettendorf.
Virgil H. Kennelly, Cupola Oper., John H. Best & Sons, Galva, Ill.
Marshall J. Lesser, Student, University of Iowa, Iowa City.
Marvin H. Linn, Mech. Engr., Deere & Co., Moline, Ill.
F. M. Moser, Dist. Sls. Mgr., Mexico Refractories Co., Rock Island, Ill.

SAGINAW VALLEY CHAPTER

Allen E. Nickless, V. Pres., Universal Engineering Co., Frankenmuth, Mich.

ST. LOUIS DISTRICT CHAPTER

Raymond Kaiser, Co-Owner, East Side Pattern & Model Co., E. St. Louis, Ill.
W. F. McKee, Fdry. Supt. Key Co., E. St. Louis, Ill.
Leonard B. Meir, Quality Pattern Co., St. Louis.
Marshal Petty, Melter, Key Company, E. St. Louis, Ill.
Joe. Rousseau, Co-Owner, East Pattern & Model Co., E. St. Louis, Ill.
Harold A. Schulte, Quality Control, Key Co., E. St. Louis, Ill.
Herbert W. Schulzenhofer, Gen. Frm. (Fdry.) Key Co., E. St. Louis, Ill.
Albert Edward Shelton, Jr., Owner, Shelton Pattern & Engineering Co.
Emil Swobada, Fdry. Frm., Busch-Sulzer Bros. Diesel Eng. Co., St. Louis.

SOUTHERN CALIFORNIA CHAPTER

Ralph M. Trent, Mgr., Pacific Coast, Pangborn Corp., San Marino.

TEXAS CHAPTER

O. M. Bartholomew, Fdry. Sls., Hughes Tool Co., Houston.

TRI-STATE CHAPTER

Floyd D. Baker, Patt. Shop Frm., Empire Pattern & Foundry Co., Tulsa.
Warren Grove, App. Patt. Maker, Empire Pattern & Foundry Co., Tulsa.
J. B. Majors, Office Mgr., Empire Pattern & Foundry Co., Tulsa.
Leonard Oswald, Patt. Maker, Empire Pattern & Foundry Co., Tulsa.
Gene Pixley, Al. Fdry. Frm. Empire Pattern & Foundry Co., Tulsa.
B. E. Reiss, C. R. Frm., Empire Pattern & Foundry Co., Tulsa.
W. R. Wood, App. Patt. Maker, Empire Pattern & Foundry Co., Tulsa

TWIN CITY CHAPTER

Kenneth L. Lynn, Frm., American Hoist & Derrick Co., St. Paul, Minn.
Ernest L. Moen, Molding Frm., Crown Iron Works Co., Minneapolis.

WESTERN MICHIGAN CHAPTER

K. E. Conklin, Michigan Wheel Co., Grand Rapids, Mich.
John W. Cotton, Sls., Corn Products Sales Co., Grand Rapids.
Fred L. Kemp, Customer Contact Rep., Lakey Foundry & Machine Co.

OUTSIDE OF CHAPTER

AUSTRALIA

Cecil H. Hoskins, Gen. Mgr., Australian Iron & Steel Ltd., Wollongong.

BRAZIL

Oscar De Araujo Fonseca Filho, Engr., Fabrica Do Realengo, Rio de Janeiro.

FRANCE

Francois Chatel, Dir. Commercial, Societe de Bayard et Saint Dizier, Haute-Marne.

BOOK REVIEWS

Metals and Alloys Dictionary, by M. Merlub-Sobel, Ph.D. 238 pages. Price $4.50. Chemical Publishing Co., Inc., Brooklyn. 1944.

Metals and Alloys Dictionary will be helpful to anyone working in the metallurgical industries, whether he is a production worker, a scientific worker or management representative.

A listing and definition of more than 10,000 useful metallurgical terms, this dictionary combines some of the better features of standard reference works. The author has made use of *Engineering Alloys* by Woldman and Dornblatt, *Metals Handbook, The Making, Shaping and Treating of Steel* by Camp and Francis, and others.

In general, new material is confined to the rare metals with which the author is especially familiar. Another feature of the book is the inclusion of a number of terms from the sciences closely related to metallurgy.

A book which covers the variety of subjects contained in *Metals and Alloys Dictionary* must necessarily be incomplete in some respects. Foundrymen will find that many terms peculiar to the castings industry are not listed. Nevertheless, the book gives foundrymen a wealth of information and is recommended to them.

Radiography in Modern Industry, by Eastman Kodak Co. 122 pages. Price is $3.00. Eastman Kodak Company, New York. 1947.

Here is a readily understood story of the theory, practice and industrial applications of radiography. *Radiography in Modern Industry* will be valuable to those considering installation of x-ray facilities, to busy supervisors interested in a survey of radiographic technique and to technical and non-technical radiographers who want a handy reference book. Engineering schools teaching non-destructive examination of materials might well use this book for the radiographic portion of the course.

This attractive book contains much of the information previously presented in a variety of smaller publications. However, the material is expanded considerably and is so well illustrated and up to date that there can be no comparison with previous Eastman publications on radiography.

Technical details are explained and illustrated by excellent pictures and drawings. Such subjects as the use of characteristic curves, approximate corrections for reciprocity law failure and depth localization are included. The book also covers film processing and a processing room layout. Protection and safety measures and a section on unsatisfactory radiographs are followed by a selected bibliography.

Tungsten, Its History, Geology, Ore-dressing, Metallurgy, Chemistry, Analysis, Applications, and Economics, by K. C. Li and C. Y. Wang. Edited by F. W. Willard. A.C.S. Monogram No. 94. Blue clothbound, 430 pages. Price $8.50. Published by Reinhold Publishing Corp., 330 W. 42nd St., N.Y.C.

The revised or second edition of this book should be of some interest to the foundryman since tungsten is used in cutting tools for machining the product of the foundry. Also, some foundry alloys for extremely high temperature applications may use tungsten as an alloying element. The foundry metallurgist and research worker will especially find the book valuable with its numerous bibliographic references at the end of each chapter. The chapters on "The Chemistry of Tungsten" and "Analysis of Tungsten" should be helpful to the foundry chemist.

The foundry purchasing agent should find of interest the chapter on "The Economics of Tungsten" as well as the Appendix which deals with purchase of tungsten ore and the purchase agreement by the Metals Reserve Company during the war.

The index appears to be quite thorough making the book so much more useful. The numerous illustrations used are excellent and the type is quite readable.

Metals and Plastics, by Thomas P. Hughes. 375 pages. Irwin-Farnham Publishing Company, Chicago. 1947.

Professor Hughes has written an excellent book, based on many years of teaching and industrial experience, which should find wide acceptance as a college text. *Metals and Plastics* can also be used by vocational schools, technical institutes and by industrial firms sponsoring training courses. References at the end of each chapter provide for the needs of readers who wish to study further. Each chapter is followed by questions which are useful for study and review.

The book covers metallurgical fundamentals, physical properties, production metallurgy with emphasis on ferrous metals, casting processes with undue emphasis on die casting, the iron-iron carbide diagram and heat treatment of steels. Mechanical working, welding, brazing and plastics complete the text.

It is interesting to see a chapter on plastics included, although this is the only non-metallic engineering material covered. No doubt this is the result of a desire to produce a text suitable for a basic course in metal and plastic fabricating methods which can be followed by special courses in junior-senior years.

Metals and Plastics is well illustrated, well printed and well written. From this book foundrymen can learn much about fundamental metallurgy and about metallurgical processes with which they are in competition, but with which they may be relatively unfamiliar.

In emphasizing the importance of ferrous metals throughout the book, Professor Hughes has almost created the impression that castings are made essentially in iron and steel foundries and in die-casting shops. Careful reading—and texts should be read carefully—reveals

(Concluded on Page 95)

★ CHAPTER ACTIVITIES ★

news

Oregon

W. R. Pindell
Northwest Foundry & Furnace Co.
Chapter Reporter

THE INITIAL FALL meeting of the Oregon chapter was held September 18 in the Georgian Room, Heathman Hotel, Portland. Prior to the technical session, the new chapter committees were presented formally to the membership.

A technical motion picture, entitled "The Manufacture of Electric Steel Castings" was shown, depicting the production of castings at the Electric Steel Casting Co., Indianapolis.

The principal speaker of the evening was Eason Miller, inspector in charge, Office of Naval Inspection, Portland. His subject "What Inspection Means and How It Aids the Foundry Industry" was well received.

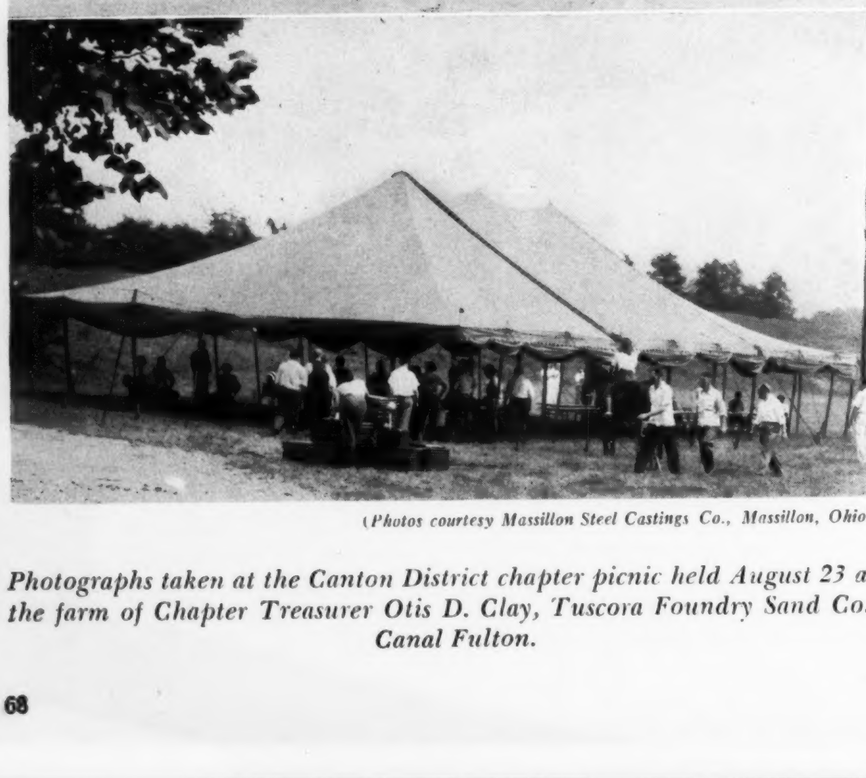
Mr. Miller traced briefly the history of naval inspection since its inception in 1794. Since a great part of his work during World War II was with the foundry industry, his remarks concerning casting defects and their detection were very pertinent. The various methods of sampling and testing used by the Navy were described and the necessity for the stringent standards of inspection were explained. Mr. Miller emphasized the benefits to the contractor on contacting his department prior to bidding on Navy work. Foundries availing themselves of this service are advised of the various tests required and may then more intelligently prepare their quotations. Mr. Miller closed his remarks by reiterating the desire of the department of naval inspection to cooperate with the foundry industry.

Central Michigan

C. C. Sigerfoos
Michigan State College
Chapter Reporter

SPEAKER FOR the September 30 meeting of the Central Michigan chapter was R. G. McElwee, Vanadium Corporation of America, Detroit. The group gathered at the Post Cereal Club House, Battle Creek and were presided over by Chapter Chairman Douglas J.

The initial fall meeting of the Oregon chapter was held September 18 with Eason Miller (third from left), inspector in charge, Office of Naval Inspection, Portland, as speaker. Others at the head table are (starting left) L. E. Bufton, Silica Products of Oregon; Bob Bremner, Electric Steel Foundry; Mr. Miller; Chapter Chairman A. R. Prier, Oregon Brass Works; J. Otis Grant, Electric Steel Foundry Co.; W. R. Pindell, Northwest Foundry & Furnace Co.; and A. B. Holmes, Crawford & Doherty Foundry Co., all of Portland.



(*Photos courtesy Massillon Steel Castings Co., Massillon, Ohio*)

Photographs taken at the Canton District chapter picnic held August 23 at the farm of Chapter Treasurer Otis D. Clay, Tuscora Foundry Sand Co., Canal Fulton.

Strong, Foundries Materials Co., Coldwater, Mich. The subject of Mr. McElwee's talk was "Specifications and How to Meet Them Today with Special Reference to Engineering Irons."

Mr. McElwee began his address by covering the factors involved in building a specification for an iron and discussed practical operating conditions in the foundry melting practice that must be carefully controlled in order to maintain the specification. He pointed out that an iron specification is more difficult to develop than one for steel because no element added to iron has a single effect. Silicon, for example, softens iron up to a certain point and further increases in silicon will tend to harden the iron.

In this connection, Mr. McElwee maintained that most foundries use too much silicon in their irons and strongly recommended the melting of irons on the "hard side" and then softening them by the use of inoculation at the furnace spout or ladle. He mentioned that this practice has been proven to give more versatility in physical properties as well as a considerable saving in money. In clinching this point, he said that silicon used as an inoculant is about three times as potent as when used in the furnace charge.

He advised that when a specification for an iron is developed the next important step is to make periodical checks upon the analysis to make sure that the chemical composition is being held within the proper limits. The practice of checking the analysis of the furnace tap was considered inadequate and Mr. McElwee advised that at least occasionally an analysis should be made of every furnace tap during the day to get a complete story of the uniformity of the metal.

A lively question and answer period followed the address.

Tri-State

R. W. Trimble
Bethlehem Supply Co.
Chapter Chairman

CHAIRMAN OF the Cupola Research Committee, R. G. McElwee, was the guest speaker before 53 Tri-State chapter members and guests at the Mayo Hotel, Tulsa, Okla., on September 19. His subject was

CHAPTER MEETINGS
NOVEMBER-DECEMBER

NOVEMBER 17
QUAD CITY
Ft. Armstrong Hotel, Rock Island, Ill.
B. C. Yearly
National Malleable & Steel Castings Co.
Highlights of Malleable Practice

NOVEMBER 18
TIMBERLINE
Oxford Hotel, Denver, Colo.
C. A. Sanders
American Colloid Co.

NOVEMBER 19
TOLEDO
Toledo Yacht Club
W. B. Wallis
Pittsburgh Lectromelt Furnace Corp.
National Officers Night

NOVEMBER 20
TWIN CITY
Covered Wagon, Minneapolis
G. Vennerholm
Ford Motor Co.
Casting Methods in Automotive Manufacture

DETROIT
Rackham Educational Memorial
National Officers Night

NOVEMBER 21
TEXAS
Houston

OREGON
Hyster Co.
Plant Visitation

BIRMINGHAM DISTRICT
Tutwiler Hotel
C. O. Bartlett
Bartlett & Snow Co.
Mechanized Foundries

NOVEMBER 24
NORTHWESTERN PENNSYLVANIA
Moose Club, Erie, Pa.
C. O. Bartlett
C. O. Bartlett & Snow Co.
Some Observations on Foundry Mechanizations

CENTRAL OHIO
Chittenden Hotel, Columbus
Howard F. Taylor
Massachusetts Institute of Technology
Steel Gating and Risering
Wilfred White
Jackson Iron & Steel Co.
Unusual Foundry Problems

NOVEMBER 28
E. CANADA & NEWFOUNDLAND
Mount Royal Hotel
Ladies Night

DECEMBER 1
CENTRAL ILLINOIS
American Legion Hall, Peoria, Ill.
Christmas Party

CENTRAL INDIANA
Anthenaeum Hotel, Indianapolis
B. C. Yearly
National Malleable & Steel Castings Co.
New Developments in Malleable Foundry Practice

CHICAGO
Chicago Bar Association

DECEMBER 4
SAGINAW VALLEY
Fischer Hotel, Frankenmuth, Mich.
H. H. Fairfield
Harry W. Dietert Co.
Sand Testing in Relation to Casting Defects
H. Y. Hunsicker
Aluminum Co. of America
Permanent Molding of Light Metals

DECEMBER 5
WESTERN NEW YORK
Hotel Touraine, Buffalo
F. G. Sefing
International Nickel Co.
Educational Program for Casting Industry

DECEMBER 9
ROCHESTER
Seneca Hotel
N. J. Dunbeck
Eastern Clay Products Co.
Chemically Coated Sands

MICHIANA
LaSalle Hotel, So. Bend, Ind.
J. C. Lucas
Meehanite Metals Corp.
Foundry Waste

DECEMBER 11
CANTON DISTRICT
Swiss Club, Canton, Ohio
Ralph L. Lee
General Motors Corp.
Man to Man on the Molder's Bench

NORTHEASTERN OHIO
Christmas Party

DECEMBER 12
WISCONSIN
Christmas Party

E. CANADA & NEWFOUNDLAND
Mount Royal Hotel, Montreal
Special Motion Picture Night

CINCINNATI DISTRICT
Blackhawk Hotel, Davenport, Iowa
Christmas Party

METROPOLITAN
Essex House, Newark, N.J.
Christmas Party

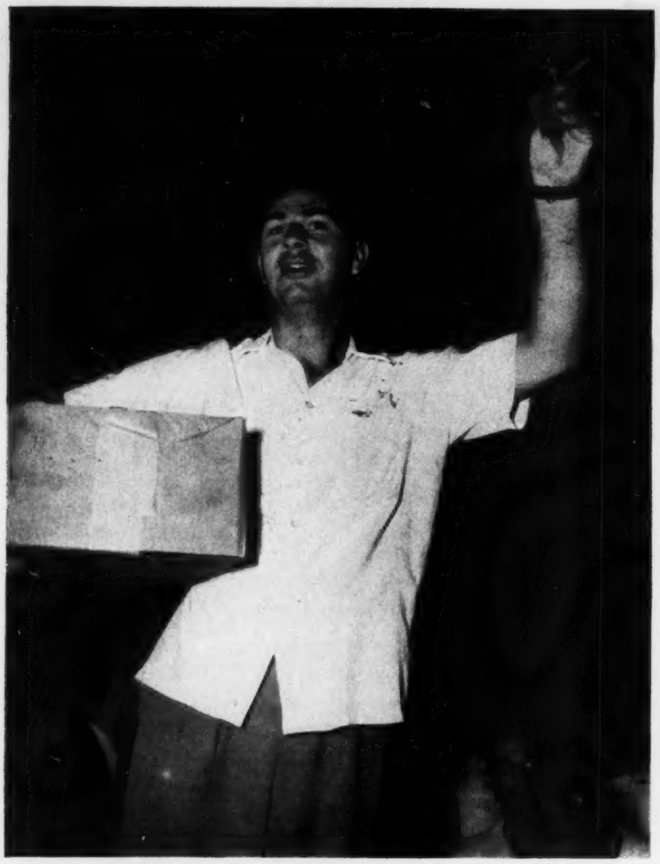
CHESAPEAKE
Engineers Club, Baltimore, Md.
Christmas Party

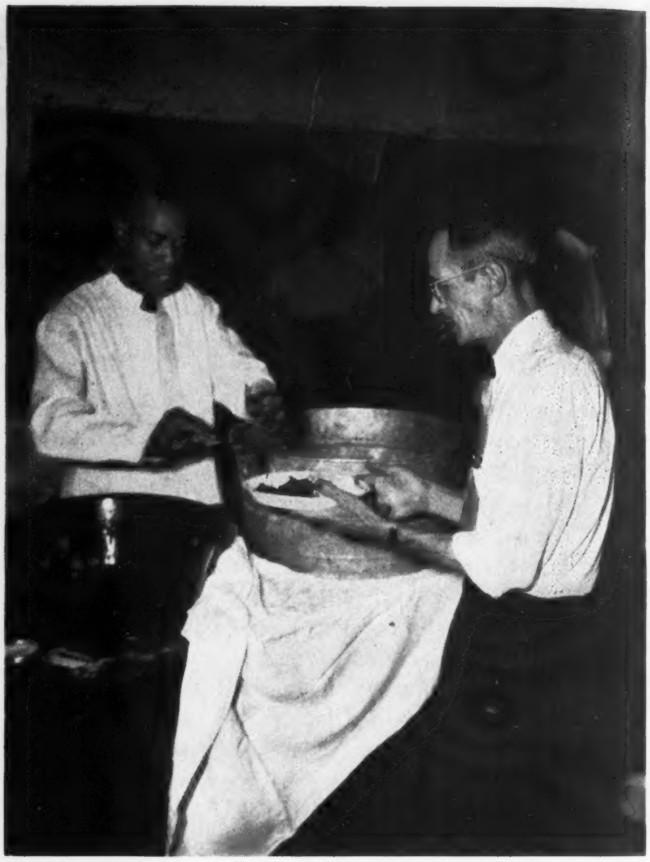
DECEMBER 13
CINCINNATI DISTRICT
Engineering Society Headquarters
Christmas Party

CENTRAL NEW YORK
Onondago Hotel, Syracuse
Christmas Party

NORTHERN ILLINOIS & SOUTHERN WISCONSIN
Faust Hotel, Rockford, Ill.
Christmas Party

DECEMBER 15
CENTRAL OHIO
Chittenden Hotel, Columbus
Frank Steinbach
The Foundry
The Foundry Trends in the Foundry Industry





A happy crowd of 656 Birmingham district foundrymen turned out for the chapter's fourteenth annual outing held in September at the Roebuck Country Club. Top (left)—Morris Hawkins, Stockham Pipe Fittings Co., yells out the number of a door prize winner. Top (right)—Serving the famous barbecue dinner. Bottom—A group typical of the many that enjoyed the day from beginning to end.

"Gray Iron Metallurgy and Foundry Practice." Before beginning his technical talk, he explained the purpose and aim of the Cupola Research Committee.

Dale Hall, chapter vice-chairman, Oklahoma Steel Castings Co., Tulsa, introduced Mr. McElwee.

Texas

W. H. Lyne
Hughes Tool Co.
Publicity Chairman

H. L. SMITH, who has been chief metallurgist, Federated Metals Div., American Smelting & Refining Co., Pittsburgh, Pa., presented a simplified and direct explanation of the phenomenon of gassing in the melting and casting of non-ferrous alloys.

If the maximum possible amount of hydrogen and oxygen are absorbed in 1,000 lbs. of a non-ferrous alloy, melted in an oil-fired or gas-fired furnace and poured at a temperature of 2050-2075° F., sufficient hydrogen and oxygen are contained to form 22 gallons of water, or if these gases could exist as water vapor, the total volume of metal plus gas would be two and one-half times the volume of the metal alone. Therefore, it becomes obvious that all possible precautions must be taken to prevent the absorption of

hydrogen and its subsequent reaction with oxygen to form water vapor. The amount of hydrogen gas which is soluble in the metal depends upon three things: (1) atmospheric pressure; (2) the head of metal in the crucible; and (3) the surface tension of the metal.

To eliminate the gas which is present in the metal, a small quantity of zinc should be added before pouring, by plunging the metal to the bottom of the crucible thus allowing the zinc vapor to flush the bath. The flushing action will be helped by keeping the surface broken by the skimmer. The vapor pressure of the zinc is sufficient to overcome the above factors, which hold the gas in the metal.

If, after these and other precautions have been taken, the operator still obtains gassing in the mold, it is very probable that the molding sand is too impermeable, too wet or both.

Mr. Smith suggests that a dry sand test bar be poured at sometime between the melt and the green sand casting operations, which will determine whether or not gassing was caused by furnace procedure or molding technique.

This meeting of the Texas chapter was held September 19 at the Texas State Hotel, Houston.

Western New York

Fred L. Weaver
Weaver Materiel Service
Chapter Secretary

PAST CHAPTER Chairman Henry C. Winte, metallurgist, Worthington Pump & Machinery Corp., Buffalo, N. Y., was the guest speaker at the first regular chapter meeting of the Western New York chapter. The subject "Gates and Risers" attracted 100 foundrymen as the meeting convened October 3 at the Hotel Touraine, Buffalo.

Chapter Chairman Elliott R. Jones, Lumen Bearing Co., Buffalo, introduced the speaker. This was the first opportunity that Past Chairman Winte had to present his talk before his own group, although the topic had been presented before a number of other A.F.A. chapters.

The subject was delivered in a very concise manner with the speaker emphasizing the necessity for mathematical accuracy in determining the relationship between sprues, gates and risers. A preference was shown by his extensive use in the adaptation of a shrink-bob to eliminate premature freezing-off at the gates.

Mr. Winte illustrated numerous applications with common risers and Washburn risers and pointed out the necessity for some standardization to control defects caused by improper gates and risers.

Quad City

C. R. Marthens
Marthens Co.
Chapter Secretary-Treasurer

FEATURE SPEAKER at the September 15 meeting of the Quad City chapter was W. B. McFerrin, metallurgical engineer, Electro Metallurgical Co., Detroit. The 125 members and guests met at the Fort Armstrong Hotel, Rock Island, Ill.

The subject of Mr. McFerrin's talk was cupola operation. Hyman Bornstein, Deere & Co., Moline, led a lively discussion on the topic.

Connecticut Non-Ferrous

Charles A. H. Knapp
Association Reporter

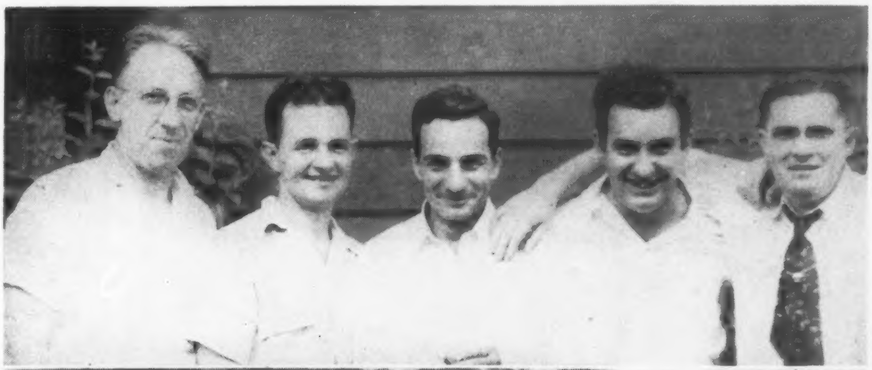
FOLLOWING AN afternoon of golf, the members of the Connecticut Non-Ferrous Foundrymen's Association held a round table discussion in the Indian Hill Country Club, New Britain, Conn. The meeting was held September 17.

A problem was presented regarding a leaky flanged casting. The piece was cast in a dry sand cheek and green sand cope and was made of 88-10-2 metal. After a lively discussion it was the consensus of opinion that the trouble could be cured as follows: (1) pattern should be split and poured on its side; (2) gates and risers should be put on each flange; (3) a generous fillet should be put on the throat where the leaks occurred and (4) an alternate suggestion was offered that the piece be cast upright as originally made but that it should pop-gate through a riser on top.

Then ensued a spirited discussion initiated by Joe Shannon on "Incipient Shrinkage." Opinions were advanced that such shrinkage was more common to 88-10-2 and 88-8-4 bronzes due to the wider freezing range in the higher tin alloys and can best be recognized by observing that the riser heads do not go down as far as on other alloys. When this phenomenon is noticed, it is almost always an indication that the casting might leak accordingly. It was further suggested that

Central Ohio foundrymen, 200 strong, attended the chapter's annual outing at the Columbus Riding Club, August 9. From early afternoon until the wee small hours the program was filled with a variety of activities.

(Photos courtesy W. H. White, Jackson Iron & Steel Co., Jackson)



the addition of one-half of one per cent nickel tended to narrow the freezing range.

A question was then asked regarding the observation of an increase in leakers due to higher humidity contents of the air. One member reported that after intensive investigation no difference was noticed. It was likewise offered by another member that aluminum alloys containing one-half per cent and more of magnesium were more susceptible to hydrogen gas pick-up during higher humidity conditions and that the gas was absorbed by aluminum oxide. Good foundry practice should be employed to free the gas, notably, that bubbling chlorine or nitrogen gas through the molten metal would dissipate the hydrogen.

In the case of magnesium castings, scrap which has lain around in the atmosphere appreciably picks up gas and results in porosity.

Cincinnati District

C. H. Fredericks
Cincinnati Milling Machine Co.
Publicity Chairman

A FIVE MAN panel, each representing a particular branch of the foundry industry, answered a variety of questions concerning "Rigging and Equipment" at the September 8 meeting of the Cincinnati District chapter. Ninety-one chapter members and guests gathered at the Engineering Society Headquarters, Cincinnati, to hear the program.

The board was composed of the following: moderator, Herman K. Ewig, Cincinnati Milling Machine Co., Cincinnati; aluminum, Walter Klayer, Aluminum Industries, Inc., Cincinnati; cast iron, Howard Pierson, Williamson Heater Co., Cincinnati; brass, William M. Ball, Jr., Magnus Brass Div., National Lead Co., Cincinnati; steel, Henry McFarland, Lunkenheimer Co., Cincinnati; and malleable, Arthur Grim, Dayton Malleable Iron Co., Dayton, Ohio.

The intention of the board was to outline the procedures followed in their foundries in determining to what extent various jobs should be rigged, tooled and priced. Although there was a great deal of variation in procedure, the end result, namely, the most economical set-up, was usually attained.

A five man board answered a variety of questions pertaining to rigging and equipment at the September 8 Cincinnati District chapter meeting. The panel was made up of the following (starting left at the rostrum) Herman Ewig, Cincinnati Milling Machine Co., (moderator); Howard Pierson, Williamson Heater Co.; Walter Klayer, Aluminum Industries, Inc.; Arthur Grim, Dayton Malleable Iron Co., Dayton; William M. Ball, Jr., Magnus Brass Div., National Lead Co.; and Henry McFarland, Lunkenheimer Co.

Southern California

R. N. Schaper
Westlectric Castings, Inc.
Chapter Reporter

"IF YOU GET your fundamentals right, the rest is a matter of detail."

These were the concluding words spoken by John Francis Drake, Kennard & Drake, Los Angeles, as he addressed the Southern California chapter at their September 12 meeting held in Rodger Young Auditorium. The technical discussion dealt with "The Laboratory and Your Foundry."

Mr. Drake stated cast iron could be made to a specific specification by means of careful chemical control. He stressed the importance of having a good chemical laboratory and making use of this control in the

foundry. By coordinating the chemical control with foundry practice, he pointed out, the customer is more apt to receive an iron that would prove satisfactory.

The speaker also pointed out that too much inoculant can ruin a good iron and spoil it for the purpose intended. Guessing the amount of inoculant which should be added is incorrect, but should be determined by careful testing and observation and working out the problem with the aid of the laboratory.

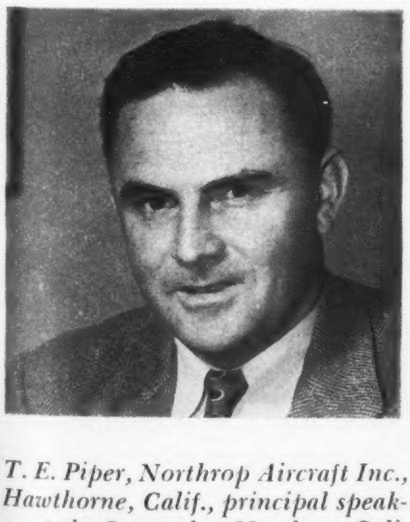
Three essential points to successfully operate a plant where molten metal is being handled were listed. They are (1) have a basic knowledge of the melting unit used in your plant; whether it is a cupola or arc furnace, (2) have regular and reliable laboratory information, and (3) keep adequate records.

Northern California

John Bermingham
E. F. Houghton & Co.
Publicity Chairman

AN INTERESTING September meeting of the Northern California chapter took place at the Engineers Club, San Francisco which featured the talk of T. E. Piper, chief materials and process engineer, Northrop Aircraft Inc., Hawthorne, Calif.

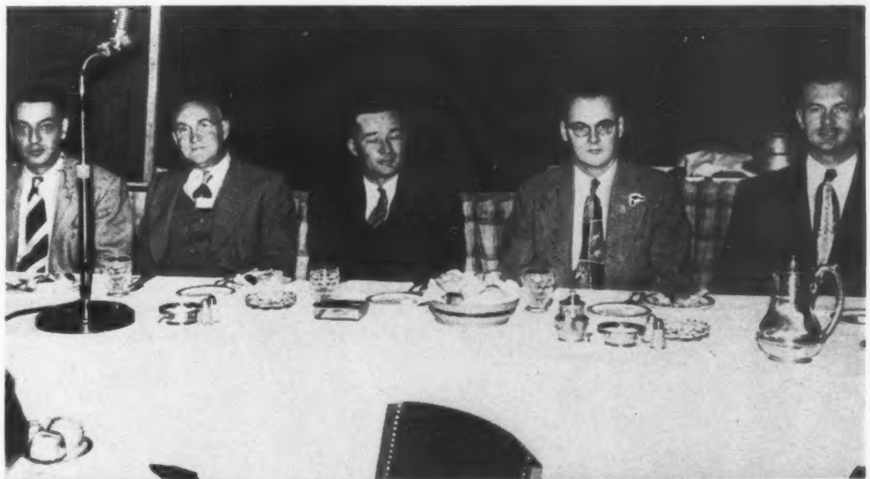
The meeting opened with Chapter President A. M. Ondreyco, Vulcan Foundry Co., Oakland, introducing the chapter officers, board members and committee chairmen.

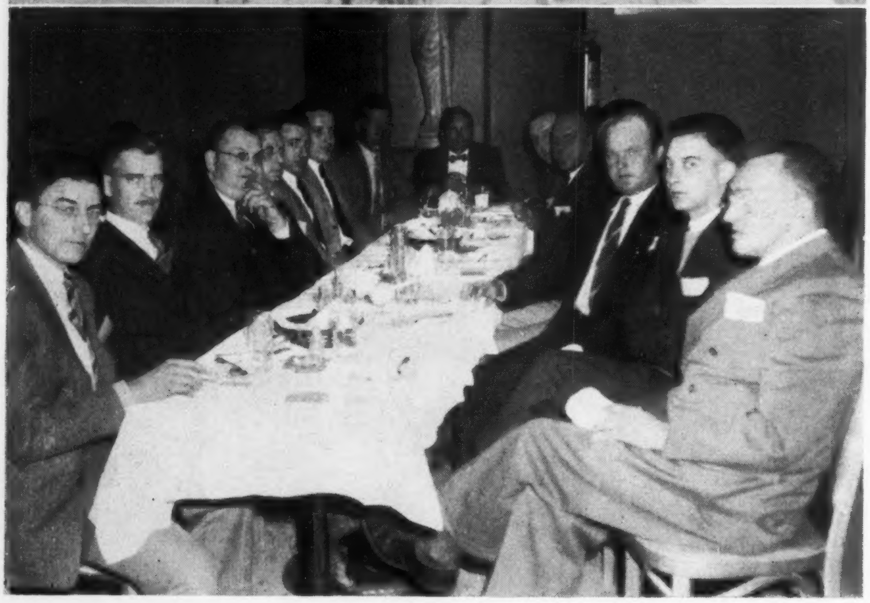


T. E. Piper, Northrop Aircraft Inc., Hawthorne, Calif., principal speaker at the September Northern California chapter meeting.

Mr. Piper presented an interesting paper that was well illustrated with slides showing casting design, applications and methods of quality control. He stressed an interesting point concerning casting defects, when he said many rejections of castings were a needless expense to the foundryman. Although present day inspection methods, such as radiographic and fluoroscopic are used, gas pockets and inclusions are

Pictures tell the story says Chicago chapter reporter George Biddle, Illinois Clay Products Co., Joliet, Ill., so below are shown photos illustrating the good attendance at the October 6 meeting. Top—Speakers table (starting left) Chapter Vice-President Chester Faunt, Christensen & Olsen Foundry Co.; Chapter President Fred Skeates, Link-Belt Co.; guest speaker, J. B. Caine, Sawbrook Steel Castings Co., Cincinnati, Ohio; guest speaker, Howard Youngkrantz, Apex Smelting Co.; and Chapter Secretary Victor Rowell, Velsicol Corp. Center and Bottom—Two groups of local foundrymen who enjoyed the meal and technical discussion.





September 22 meeting of the Northwestern Pennsylvania chapter. Top—N. J. Dunbeck, Eastern Clay Products Inc., Jackson, Ohio, guest speaker, with (right) Chapter Chairman John W. Clarke, General Electric Co., Erie. Bottom—A group from the Griswold Mfg. Co., Erie.

responsible for castings being rejected while the design, application or the location of the irregularities did not necessarily mean that the castings were defective.

Magnetic inspection for ferrous alloys and black light process for non-ferrous castings was well illustrated and ably explained.

Mr. Piper emphasized that he does not believe there is such a thing as a perfect casting, as modern inspection methods reveal casting irregularities. He pointed out that industry should give consideration to the quality requirements as well as the application of the casting in the finished product before rejection is considered necessary.

At the conclusion of his address, Mr. Piper handled questions from the floor to the satisfaction of all concerned.

Northwestern Pennsylvania

Earl M. Strick
Erie Malleable Iron Co.
Chapter Reporter

AT THE FIRST meeting of the Northwestern Pennsylvania chapter held September 22, Moose Club, Erie, N. J. Dunbeck, Eastern Clay Products Inc., Jackson, Ohio, gave a discourse on "Chemically Treated Sand." Presiding over the meeting was John W. Clarke, General Electric Co., Erie, chapter chairman.

The speaker stated that this plastic sand should only be used in foundries that have good sand conditioning equipment and sand control personnel to see that it is properly used. He added that though the sand is still in the experimental stage it is working successfully in a number of foundries. Some of the benefits derived from the use of chemically treated sand include cleanliness of sand, high flowability and workability, does not dry out quickly and low moisture content.

Question Period

Mr. Dunbeck answered a number of questions following his lecture. Frank P. Volgstadt, Griswold Mfg. Co., Erie, acted as discussion leader during the question and answer period.

Two special features at the meeting included a piano and violin duet by Courtney Wilcox, Cascade Foundry and Arthur Collenburg, Erie Forge Co., and colored movies of the Rose Bowl game taken by Mr. Volgstadt while he was in California last year.

Chesapeake

L. H. Denton
Baltimore Convention Bureau
Secretary-Treasurer

AT THE September 26 meeting of the Chesapeake chapter, the membership had the privilege of hearing Thomas Curry, Lynchburg Foundry Co., Lynchburg, Va., discuss "Chemically Treated Sand." The group held their dinner and technical session at the Virginia Hotel, Lynchburg, Va.

In touching upon the coating process, the speaker explained the following steps.

(a) Mix washed and damp silica sand with a proportionate amount of the water-soluble chemical in the ordinary foundry mixer.

(b) Pass through rotary drier at 300 to 350°F, to evaporate solvent and water vapor and set coating on grain.

(c) Mix in muller with correct proportions of bentonite, cereal, the water-soluble chemical and water to develop the working properties necessary for molding.

He also listed a number of advantages in using chemically treated sand which are:

(a) Due to increased flowability

and toughness, molds can be made more quickly and require less jolting.

(b) The milling time is reduced in comparison to conventional sand. The characteristics of the sand can be controlled more readily and closely. These factors increase the capacity for molding and sand-mixing equipment.

(c) Finer sand, with a lower moisture content, can be used producing a cleaner, smoother casting surface and less vapor pressure in the mold.

(d) The same sand can be used for both large heavy castings and small light castings, giving a greater flexibility to the system.

(e) Due to the cleaner surface of the metal, the shot-blasting time has been reduced from 50 to 35 per cent of the former time, and the grinding time has also been reduced 10 per cent. This results in a decrease of labor cost and increases the capacity of the cleaning department.

(f) Better working conditions due to less black dust and smoke in the air.

(g) A reduction in the time and labor required at the shakeout, as the sand shakes free from the casting and flask in less time and with less effort than conventional sand.

(h) The scrap loss is reduced because of better molds and cleaner surfaces.

(i) More uniform hardness throughout the mold.

(j) Lumping in the sand has been largely eliminated.

(k) Facing sand, spraying or skin drying are not required to facilitate clean peeling of the sand to obtain a good surface finish on the casting. This means a better product with a reduction in labor and equipment.

(l) A reduction in the loss of molds, caused by the mold sticking to the pattern, when the mold is lifted.

(m) The cost of chemically treated sand in a given mold, is greater than for conventional sand, but the resulting economies indicate a lower over-all expense.

Central Illinois

G. H. Rockwell
Caterpillar Tractor Co.
Secretary-Treasurer

SPEAKER FOR the first evening meeting of the Central Illinois chapter was C. O. Burgess, metallurgical engineer, Union Carbide & Carbon Research Laboratories Inc., Niagara Falls, N.Y. The dinner and talk was held at the Jefferson Hotel, Peoria, Ill., October 6. Mr. Burgess chose as his subject "Structure and Properties of Cast Iron as Affected by Melting Practice, Inoculation, Low and High Alloy Content." Well illustrated with slides, the talk aroused an interesting discussion.

Central Michigan

A HIGHLIGHT of the September 30 meeting of the Central Michigan

Right—Guests from the Quad City chapter, led by Chairman R. H. Schwartz (left), Riverside Foundry, S & W Foundry Corp., Bettendorf, Iowa, attended the October Central Illinois meeting. Below left—(Starting left) Chapter Vice-Chairman F. W. Shipley, Caterpillar Tractor Co., Peoria; Speaker C. O. Burgess, Union Carbide & Carbon Research Laboratories, Inc., Niagara Falls, N. Y.; and Chapter Chairman A. V. Marthens, Pekin Foundry & Machine Co., Pekin, talk it over. Bottom right—Central Illinois chapter officers and directors.

(Photos courtesy Caterpillar Tractor Co., Peoria)

chapter was the presentation of the slate of candidates for 1947-48 chapter offices. Balloting is being done by mail with the announcement of the final tabulations scheduled for the group's November meeting.

Technical speaker was R. G. McElwee, Vanadium Corp. of America, Detroit. The present Chapter Chairman Douglas J. Strong, Foundries Materials Co., Coldwater, was the presiding officer.

New England

Merton A. Hosmer
Hunt-Spiller Mfg. Co.
Association Reporter

A RECORD gathering of 150 foundrymen attended the October 8 meeting of the New England Foundrymen's Association when they met at the Engineers Club, Boston, to hear a fellow member, Henry Stenberg. Mr. Stenberg's subject was "Some Practical Things Learned and Accomplished in the Operating of a Mechanical Molding Unit."

Mr. Stenberg outlined a unique method of establishing rates for molding where the incentive plan is used. The formula is dependent upon the cubic contents of the mold. He described the plan as a very simple one and one which is advisable inasmuch as the molder can easily understand the method of obtaining rates. Thus he would not have to wait two weeks or more to find out his bonus. He emphasized the importance in connection with this incentive plan, that you are not changing rates from time to time.

The speaker then went into considerable detail in the description of their sand handling unit. He stated that the shake-out was used on every type of casting except where breakage might be excessive, in which case he suggested either to eliminate the shakeout or change the design of casting. He brought out the fact that with this mechanical lay-out the core room must supply sufficient cores at all times or the advantage of the system is lost. They have several relief men available during the day in order to keep the unit operating most efficiently.

Mr. Stenberg concluded his address by showing a very enlightening film on the mechanical molding unit after which the meeting was thrown open for questions. Mr. Stenberg's thorough knowledge of his subject contributed to a most successful evening.

St. Louis

Paul C. Schwarz
National Bearing Div.
Publicity Chairman

THE PRINCIPAL speaker at the October 9 meeting of the St. Louis District chapter was A. F. Pfeiffer, Allis-Chalmers Mfg. Co., Milwaukee. He spoke to the chapter on the subject "Coordinative Function of Pattern Equipment and Castings." Mr. Pfeiffer stressed the use of pilot models and the cooperation between engineering and patternmaking supervision.

During the coffee period, the members were entertained by the Police Quartet of the St. Louis Police Department.

A. F. Pfeiffer, Allis-Chalmers Mfg. Co., Milwaukee, talking to the St. Louis District chapter members. Mr. Pfeiffer is Chairman of the American Foundrymen's Association Pattern Division.

The police quartet that serenaded the St. Louis District chapter recently was quite busy handing out songs instead of traffic tickets. The harmonious notes were dispensed by (left to right) Sgt. Imhof, Fred Johannymier, Arthur Neely, John Tudor and Frank Vernaci, pianist.

Twin City

A TURN OUT of 90 foundrymen initiated the 1947-48 Twin City chapter season October 10.

Chapter Chairman S. P. Pufahl, Pufahl Foundry Inc., Minneapolis, introduced A.F.A. Past President S. V. Wood, Minneapolis Electric Steel Castings Co., Minneapolis, who, in turn, presented G. W. Cannon, president, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich. Mr. Cannon was the coffee talker and in a few well chosen words emphasized the need for the production of good castings.

The guest speaker was O. J. Myers, Werner G. Smith Co., Minneapolis, who discussed the role of the research laboratory in developing new types of core binders for foundry use. Mr. Myers touched upon an experimental core oil which has been developed that can be used in an absolutely dry sand with no other ingredient necessary to produce either green or baked bond. A lively discussion on sands, binders and general foundry practice followed the lecture.

Photographs taken at the October 10 meeting of the Twin City chapter. Left—Members greeting each other. Right—(starting left) Messers Cannon, Wood, Pufahl and Myers.

Oregon

W. R. Pindell
Northwest Foundry & Furnace Co.
Chapter Reporter

THE OCTOBER meeting of the Oregon chapter was held October 13 at the Heathman Hotel, Portland. National President Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va., was the honored guest. He gave a short coffee talk on the use of chemically treated sand as used at the Lynchburg Foundry.

Technical speaker of the evening was Neil Wilcox, Electric Steel Foundry Co., Portland, whose subject was "Production of Centrifugal Castings." Mr. Wilcox gave a very interesting talk describing the methods used and the results obtained by his company in their centrifugal casting department. Using slides, the speaker showed the different types of castings produced by the centrifugal, semi-centrifugal and centrifuge processes, and the machines used. Both the economic aspects and the hazards of these processes were emphasized.

On October 11 the chapter held a fall golf tournament at the Broadmoor golf course.

British Columbia

Norman Terry
Canadian Sumner Iron Works Ltd.
Chapter Chairman

THE HOTEL GEORGIA Ballroom, Vancouver, British Columbia, was

(Continued on Page 86)

Golfers relaxing after an 18-hole dirge around Broadmoor golf course. The divot diggers belong to the Oregon chapter and the "action" shown here took place on October 11 when the chapter held its fall golf outing.

★ NOVEMBER WHO'S WHO ★

Fred Cousans

Author of the 1947 IBF-A.F.A. exchange paper is Fred Cousans, steel castings controller, Hadfields Ltd., Sheffield, England . . . Born in Lincoln, England . . . Attended the Institution of Metallurgists . . . Began his industrial career in 1924 as technical assistant, Babcock & Wilcox, Lincoln, and later that same year joined John Brown & Co., Scunthorpe . . . In 1928 was appointed steel plant superintendent by the John Brown firm and remained same until 1931 . . . Thomas Firth & John Brown Ltd. named him directors assistant and was promoted in 1940 to works manager . . . Associated with Catton & Co., Leeds, (1944) he assumed the position of works manager . . . Was appointed to his present title in 1947 . . . A frequent contributor to the British trade press, he has also been a popular speaker before meetings of British technical societies . . . Nature of subjects written and discussed include properties of steel castings, surface drying of molds and other topics . . . A member of A.F.A., Iron and Steel Institute (British) and Institute of British Foundrymen.

C. C. Wright

A shortage in pig iron was recently experienced by the gray iron castings industry and now it is coke . . . A report on the use of anthracite coal as cupola fuel is published herein and was prepared by C. C. Wright . . . Since 1939, Mr. Wright has been professor of fuel technology, Pennsylvania State College, State College, Pa. . . . He has also been chief of the fuels division at the Pennsylvania State College, receiving that appointment in 1944 . . . Mr. Wright was born in Southport, England . . . Attended and graduated from the University of Washington, Seattle . . . Obtained his Bachelor of Science degree in chemical engineering in 1927, and his Ph.D. in 1931 . . . Research assistant at the University of Washington from 1931-32, he received a fellowship at the Pennsylvania State College through the National Research Council (1933-35) . . . Joining the college staff in 1935 as research associate, he was appointed associate professor in 1937 . . . His findings have been widely published by the trade press and he has talked before a number of technical societies.

S. G. Garry

Mr. Garry has served as general foreman of the foundry division, Caterpillar Tractor Co., Peoria, Ill., since 1930 . . . He has written a number of articles for AMERICAN FOUNDRYMAN relative to employee relations and aluminum and magnesium . . . He was born in Muskegon, Mich., and he entered the foundry industry with Lakey Foundry & Machine Co., Inc., Muskegon, as a coremaker in 1926 . . . Moved to Campbell, Wyant & Cannon Foundry Co. in 1928 . . . Has been active in foreman training circles of the Association serving currently as chairman of the committee and also a member of the apprentice contest committee . . . Has presented a number of talks before A.F.A. local, regional and national meetings.

O. A. Schmidt

A. O. Schmidt is in charge of metal cutting research, Kearney & Trecker Corp., Milwaukee . . . For ten years was a mechanical engineer with Carl Zeiss Optical Works . . . Took graduate work at the University of Michigan, Ann Arbor, under Professor Boston . . . Taught production engineering at Colorado State College of Agriculture & Mechanical Arts, Fort Collins; University of Illinois, Urbana and Marquette University, Milwaukee.

E. V. Blackmum

Aluminum foundry and fabricating practices have been discussed by E. V. Blackmun in the trade press and before a number of technical groups . . . Presents data on impregnation of aluminum and magnesium castings in this issue . . . Born in Boston and graduated from Tufts College, Medford, Mass., in 1932 with a Bachelor of Science degree in chemical engineering . . . Attended Harvard Graduate School of Arts and Sciences, Cambridge, during 1933 . . . The following year joined Aluminum Company of America, research laboratory, Cleveland . . . From 1935-45 was metallurgical engineer with the Aluminum company . . . Was appointed chief works metallurgist in 1945 . . . A member of American Foundrymen's Association and American Society for Metals.

L. F. Tucker

Leonard F. Tucker is a native of Hamilton, Ont., Canada, and he received all his schooling there . . . Moved to Detroit in 1919 and began his patternmaking apprenticeship with Studebaker Corp. . . . On completion of his four year term of study, he remained with Studebaker as a patternmaker for another 12 years, moving with the organization to South Bend, Ind., in 1926 . . . Mr. Tucker organized his own firm (1935) under the name of City Pattern Works at South Bend . . . The firm was incorporated as City Pattern & Foundry Co. in 1945 . . . Interested especially in promotion of closer relationship between patternmaker and foundryman, Mr. Tucker has concentrated his efforts toward this objective in the technical-educational programs of A.F.A. . . . He has prepared technical papers for the Association on pattern rigging for production molding and cooperation between pattern shop and foundry and has taken an active part in its local, regional and national meetings . . . He has served as a member of the pattern division executive committee for a number of years as well as a member of other committees . . . Affiliated with the A.F.A. Michiana chapter.

NEW FOUNDRY PRODUCTS

Power Discs

Aristo Power Tools, Inc., 601 West Washington Blvd., Chicago 6, has designed a sanding disc for use on all types of flexible shaft and portable disc sanders. Sharp-cutting aluminum oxide grit is used, resin-bonded to a fibre backing. Available in both 7-in. and 9⅛-in. diameter sizes and grit densities.

Brass Collets

South Bend Lathe Works, 91 E. Madison St., South Bend, Ind., has announced a line of precision draw-in collets made of brass, manufactured to the same tolerances as those of hardened steel. Designed to offer a low cost advantage for jobs requiring odd sizes, the brass collets are reported to give good service on short run production jobs. They may be machined for holding tapers or irregular shapes, and bored for larger diameter when worn or scored. Available in four styles and standard sizes.

Inspector

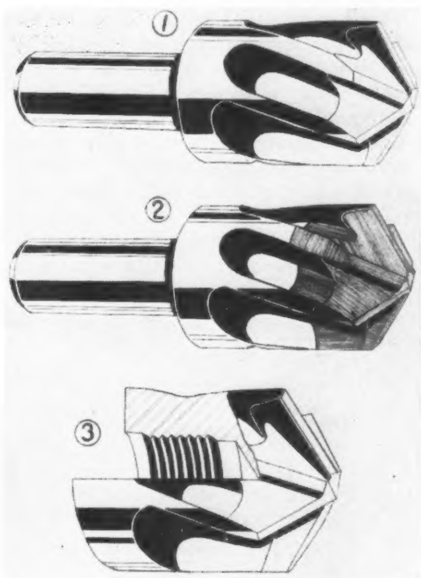
Arma Corp., Brooklyn, N. Y., announces an automatic inspection system for small parts. System includes an electronic light-indicating comparator with automatic classification of parts up to 1½-in. sphere maximum size. Equipment inspects, counts and sorts parts and places them in good and rejected groups.

Welding Control

Westinghouse Electric Corp., P.O. Box 868, Pittsburgh 30, has a complete line of non-synchronous AC resistance welding controls known as weld-o-timer. Made in two frame sizes, the 1200 and 600, these units are delivered in a unified, factory assembled package. They can be side mounted to the welder, mounted on the floor next to the welder or mounted at any convenient place away from the welder with adjustment controls at the welder. Convenient finger tip control speeds production as each job can be quickly set. Voltage regulator tubes are incorporated in timing circuits to give more accurate timing when connected to welder supply circuits.

Countersinks

Severance Tool Industries, Inc., Saginaw, Mich., announce countersinks having 60° angle with C/L made standard in 9 sizes up to 1-in. diameter. Other standard angles in the standard series are 30°, 41° and 45° with C/L in sizes up to 2-in. diameter. Countersinks are also available in cemented carbide in the sizes up to 1½-in. diameter and in the same standard angles as for high speed countersinks. Countersinks with threaded bodies have been added in sizes 1-in. diameter and larger. These countersinks feature shear-cutting teeth, staggered both as to spacing and shear-angle which effectively precludes chatter and results in faster cutting of seats.



Tip Cleaners

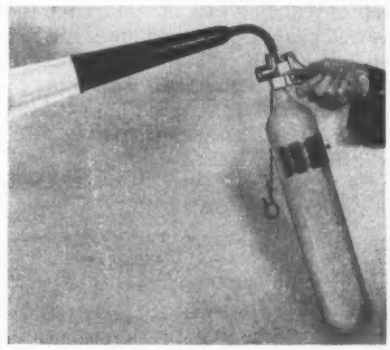
Air Reduction Sales Co., 60 East 42nd St., New York 17, manufactures tip cleaners for use in cleaning oxyacetylene welding and cutting tips. Available in two individual packages. Set no. 1 contains 12 cleaners for drill sizes ranging from nos. 75 to 49. Set no. 2 contains 9 cleaners for drill sizes ranging from nos. 48 to 30. Cleaners are made of corrosion resistant stainless steel and each set comes in a leather case.

Welding Rods

All State Welding Alloys Co., 96 West Post Road, White Plains, N.Y., has added two new nickel-silver welding rods to its line of low-temperature welding and brazing alloys and fluxes. One of the new rods is recommended for fabrication of light steel and nickel alloy sections and is considered suitable for welding steel, stainless steel, copper-nickel alloys and nickel; the other is designed for use where resistance to frictional wear is desired and especially on worn or broken parts.

Fire Extinguisher

American-LaFrance-Foamite Corp., Elmira, N.Y., has announced a new, light weight carbon dioxide fire extinguisher, known as the "Alfco Speedex," rated B-2, C-2, by the Underwriters' Laboratories. Extinguishing agent is carbon dioxide, which is released by pressure of the palm of the hand on a squeeze-type valve. The gas is odorless, non-corrosive and non-poisonous, and will not conduct electricity nor freeze at normal temperatures. Total weight of unit is 12 pounds; contents, 3⅝ pounds.



Abrasive Wheel

Manhattan Rubber Div., Raybestos-Manhattan, Inc., Passaic, N.J., has added "Resin Bonded Diamond Wheels," for grinding carbides and carbide-tipped tools, to the firm line of abrasive wheels. An exclusive feature claimed for the wheel is that the special resin bond will not load or glaze when coming in contact with tool steel shanks, and, thus, dressing or lapping usually necessary to clean the bond is eliminated. The line includes a complete selection of wheel types and sizes, in grit sizes from 60 to 400.

Grain Refiner

The National Smelting Co., 6700 Grant Ave., Cleveland, announces three new grain refiners which add grain refining elements to aluminum alloys in addition to a cleaning action. Refiners aid in decreasing shrinkage and hot shortness in both sand and permanent mold castings. Additions of ¼ to ½ lb. per 100 lb. of aluminum is the usual amount added to the metal.

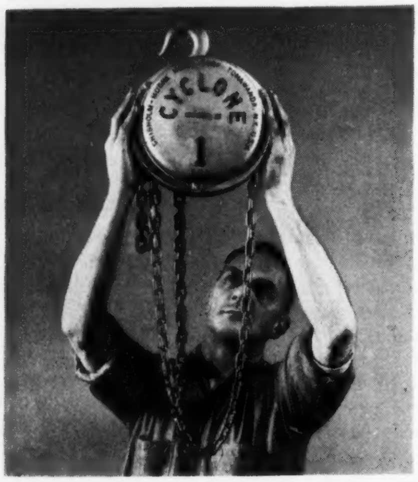
Cupola Ash Collector

C. C. Hermann & Associates, 5731 Somerset Drive, Detroit 24, have designed a cupola fly ash collector to fit all sizes of cupolas for the removal of fly ash, cinders and quenching of sparks and flame exhausted by the cupola. The equipment is essentially a water-cooled cap which fits over and rests on top of the cupola stack. Water from a pressure supply passes upward through the conical water jacket, gushes out the top plate through a circular

hole at the apex of the cone and flows in a spreading even sheet over the top plate keeping this plate cool and clean. The water then flows downward over the edge of the cone forming a water curtain through which the gases from the cupola must pass. The collected solids are carried out the effluent discharge pipes at each side of the unit.

Chain Hoist

Chisholm-Moore Hoist Corp., Tonawanda, N. Y., announces a high speed hand operated hoist with the use of steel and aluminum alloys reducing the weight nearly 45 per cent. A reduction in the number of component parts is another feature of the hoist. Fewer parts, precision anti-friction bearings and sealed-in lubrication increase lifting speed, reduce operator fatigue. Improvements have been made in the lift wheel, load chain guide, gearing and load brake. Attention was given to reducing to a minimum the pull required by the operator to lower the load. A light pull is sufficient to unlock the brake and lower the load. Known as the cyclone model M, the speed hoist is available in four standard capacities: 1/4, 1/2, 1 and 2 ton.



Crucible Furnace

Eclipse Fuel Engineering Co., Rockford, Ill., is offering two series of gas-fired crucible furnaces. The Eclipse "RB" stationary furnace is designed for heavy foundry production in the melting of brass, bronze, aluminum and other alloys.

"SB" series furnace is similar but incorporates the "HE" entrainment burner, which maintains a constant air-gas ratio over an extremely wide turn-down range. The "SB" series has swing-back cover. Both types employ heavy sheet-metal shell construction and highest quality refractory linings.

Carbon Monoxide Detector

United States Safety Service Co., 1215 McGee St., Kansas City, Mo., is licensed by the government to manufacture a carbon monoxide indicator. The detector is about the size of a pencil and was used extensively during the war. It will detect less that 1 part of carbon monoxide per 500 million parts of air. The detector consists of a small glass tube sealed at both ends and a rubber bulb packed into a kit that fits the pocket. When the presence of monoxide is suspected the kit can be opened, the tip broken off a small tube and one end inserted in the bulb to draw air samples through the chemicals in the tube. Carbon monoxide will turn the yellow chemicals green in thirty seconds. The darker the shade of green, the higher the concentration. A matching color chart tells the concentration.

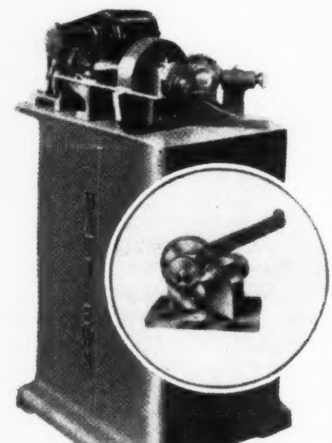
Marking Machine

Jas. H. Matthews & Co., 3901 Forbes St., Pittsburgh 13, has developed a motor-driven and hand operated marking machine for precision marking on cylindrical sleeves and similar type parts.

The motor-driven machine is designed for marking parts up to approximately 6-in. in diameter with the usual combination of graduation numbering and small amount of lettering usually appearing on such parts. A spring cushion provides for marking parts which have a slight variation in diameter. Depth of marking is controlled by knurled hand-wheel adjustment of spring pressure.

Hand operated machine will mark graduations and numbers on small parts up to approximately 3-in. in diameter. Recommended where marking requirements are limited and production is not necessarily of prime importance.

In both machines the part to be marked is placed over the mandrel and locked in place through the use of a quick-acting mechanism.

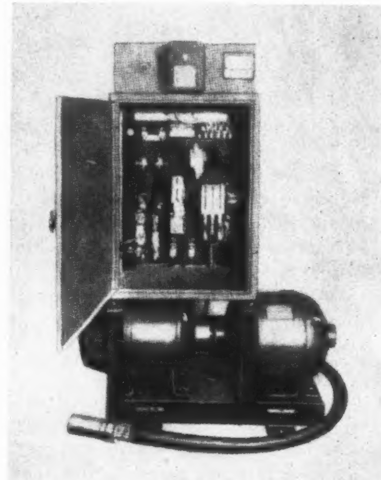


Metal Cleaning Tank

D. C. Cooper Co., 1467 S. Michigan Ave., Chicago 5, has developed a gas-fired tank for cleaning metal parts. Tank is also equipped with steam coils where steam heating is desired. Tank is built of heavy gauge metal with 4-in. heating pipes in the bottom of the tank. Fumes are removed through a duct which extends the length of two sides and the back of tank, to which an exhaust fan can be connected. Comes complete with thermometer, drain, overflow connections and can be equipped with an automatic agitating device.

Battery Charger

General Electric Co., Schenectady, N. Y., is the maker of a heavy-duty battery charger for industrial trucks. The requirement is packaged into one unit consisting of a single-circuit battery-charging motor-generator set, with its control cabinet mounted on a structural steel framework. It is completely wired and assembled before shipment. The equipment meets the requirements of an 18-cell, 550-ampere hour, lead acid type storage battery. Generator is a conventional 47 volt AC machine.



Mixer

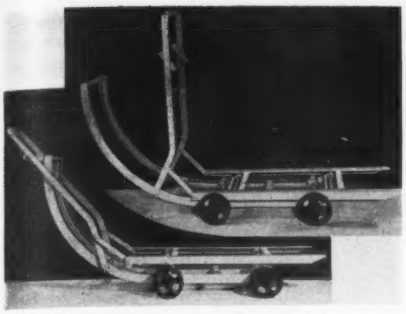
Bramley Machinery Corp., 15 Park Row, New York 7, is manufacturing a mixer for the blending and wetting of ingredients used in making refractory and ceramic products. Mixing operation is positive because all materials pass between the blades, thus producing an intimate mix in a minimum of time. Each paddle has two blades. The faster paddle revolves at twice the speed of the slower paddle.

Electrode

Air Reduction Sales Co., 60 East 42nd St., New York, has developed an electrode for machinable welds on cast iron. This electrode has a high nickel core wire and a heavy extruded coating. Ordinarily preheating is not necessary. Will withstand hydrostatic pressure and may be used with ease in the downhand, vertical or overhead positions. May be used on either AC or DC and is available in 5/32-in. and 1/8-in. diameters.

Clamp

Marman Products Co., Inc., Inglewood, Calif., has designed a clamp for use in any and all structures where a wrap-around clamp action is required. By simply wrapping the clamp around an object and tightening the locking and take-up screws, intense pressure can be obtained. Unique design permits clamping of many different shapes and objects. Consists of a tough, snap-on interchangeable stainless steel strap, furnished in 1 1/2 or 2-in. widths of any desired length, a square swivel assembly, and take-up and locking screws.



Handlift Truck

Rockwell Mfg. Co., Arcade Mfg. Div., 1212 East Shawnee St., Freeport, Ill., announces a light hand-lift truck for handling "short move" jobs involving loads up to a ton. Used for moving skids, boxes and trays of material. Overall length 70-in., and the platform area is 11¾ by 43-in.

Oxygen Apparatus

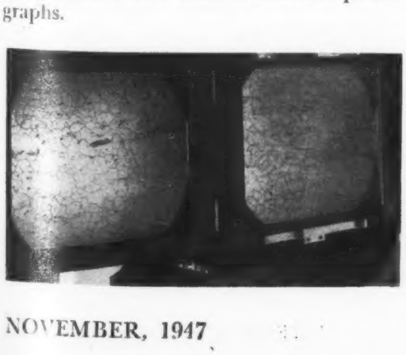
Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, is the manufacturer of a self-contained breathing apparatus in which the wearer is independent of the outside air. It affords complete respiratory protection for a minimum of 45 minutes and generates its own oxygen for the wearer with a replaceable canister. Chemical evolvement of oxygen in the "chemox" replaceable canister occurs by reaction with the wearer's exhaled breath and produces a supply of pure oxygen in exact accordance with his varying breathing requirements. Weighing only 13½ lb. complete, the "chemox" is simple to use and maintain. Insertion of canister prepares the apparatus for immediate use. Canister weighs 4 lb.

Electrode

Air Reduction Sales Co., 60 East 42nd St., New York, announces a line of stainless steel electrodes in a full range of grades and diameters. Electrodes are furnished with a heavy extruded lime type coating for DC application; and in addition all but the straight chrome analyses are obtainable with a lime-titania type coating which is usable on AC or DC. Slag produced by either of these coatings is easily removed.

Grain Size Comparator

Westinghouse Electric Corp., 306 Fourth Ave., Box 1017, Pittsburgh 30, has developed a grain size comparator that can be easily attached to a standard metallograph. This ground-glass screen hinged to an illuminating unit with a slotted wooden frame, provides for counting the grains in a certain area or estimating their extent by comparison with a series of standard photographs.



To determine the grain size of a specimen, a polished and etched sample is placed on the stage of the metallograph and projected in magnified form on the glass screen. Its granular boundaries can be seen clearly. A transparent slide of a known, standard grain structure is slipped into the wooden frame and illuminated by incandescent light. The magnifying power of the metallograph is then changed by extending the bellows until the unknown image matches the grain size of the standard. The amount of adjustment needed is read from a scale on the metallograph, and grain size of the unknown specimen determined by reference to a standard graph.

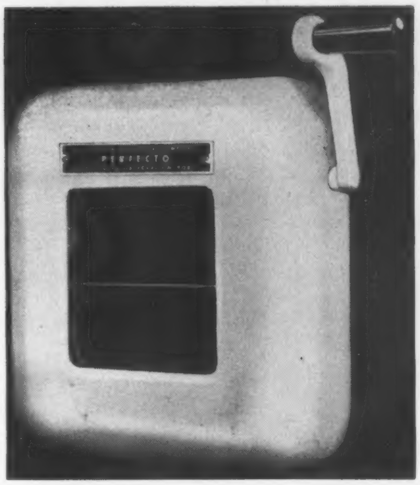
Permmeter

Harry W. Dietert Co., Detroit 4, is manufacturing a permmeter for determining the permeability (air flow) of foundry molding materials. It is a direct reading permeability meter which measures the air flow through specimens of any material. An automatically operated electric timer

unit, driving a circular dial reading in cubic centimeter air flow per minute at one gram pressure, is employed with a gasometer unit. The movement of the gasometer bell automatically starts and stops the timer unit when a given quantity of air or chosen gas is passed through the test specimen. The Permmeter performs all of the necessary timing and calculations.

Soap Dispenser

West Disinfecting Co., 42-16 West St., Long Island City 1, N.Y., has designed a soap dispenser that allows a predetermined amount of soap to be dispensed with a minimum of waste and effort. Made of steel and with a chrome plated base this dispenser has many new features. It contains no screw heads or other obstructions to prevent easy cleaning, prevents user from putting wet hands into container and clogging it, has no hinged or loose lids, clog-proof measuring valve and view window permits checking amount of soap. Available is an adapter for use on wash fountains.



Furnace Port

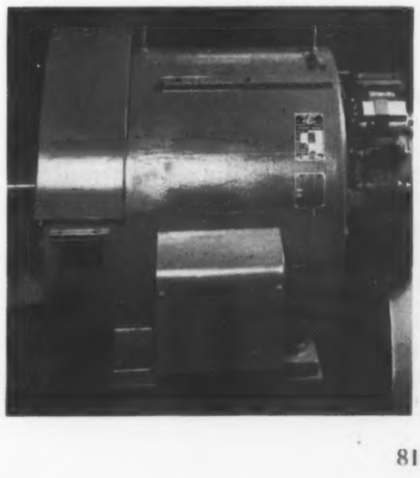
A. P. Green Fire Brick Co., Mexico, Mo., has introduced an air-cooled observation port for use in all types of industrial furnaces. Weighing only 14 lb. it can be installed in any new or old furnace wall; common brick, firebrick or steel cased. The wide angle vision of the port permits the operator to observe furnace and grate conditions with no disturbance of the firing cycle and without exposure to heat or glare. Simply designed, with self closing air-cooled ribbed shutter and divided blue pyrex window, prevents malfunction from furnace heat.

Electrode

General Electric Co., Schenectady 5, N. Y., has an electrode for welding cast iron where the weld must be machineable. Designated W-2075, the electrode is composed of pure nickel core wire and an extruded black covering which is largely consumed in the arc and produces very little slag. May be used in all welding positions.

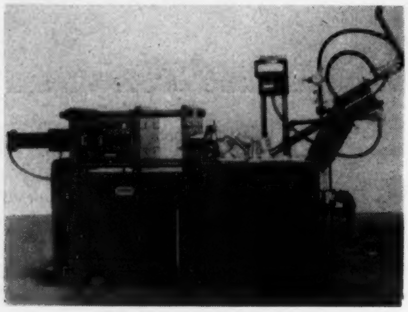
Generator Set

Electric Machinery Mfg. Co., Minneapolis 13, has developed a quick-acting, automatic regulating type generator set for powering high-frequency portable tools. The "regulectric" voltage regulating circuit built into the generator provides positive, instantaneous restoration of voltage to normal whenever there is a change in load. Popular ratings of high-frequency the generator sets are 31.3 and 63 kva, in standard voltages of 240 or 480 at 180 or 360 cycles.



Dust Mask

Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, announces a new dust mask that combines facial and respiratory protection without obstructing vision. Lightweight and flexible, the mask covers the entire face, conforming snugly to facial contours. Headbands are easily and quickly adjustable. Filters are in aluminum containers which are placed low at the sides of the mask to permit good vision. A rubber exhalation valve provides breathing ease and quick drainage of moisture.



Die Casting Machine

Ermac Co., 1426 So. Santa Fe Ave., Los Angeles 21, is manufacturing an air operated die casting machine. This medium sized machine, needing only the slightest possible installation, measures 22 in. x 72 in. and 40 in. high and takes a minimum of floor space. In construction the unit features single hook-ups for air, gas and 110 volt electrical current. Blow torches are furnished for properly heating gooseneck and nozzle. Standard equipment also includes pyrometer, thermocouple, holding furnace and gas-burner. The holding pot has a capacity of 300 lb. of zinc alloy. A 4½-in. lining of fire brick insulation is a feature of the furnace. A safety vent is also provided to take care of any metal which might get into the furnace by accident.

Drill Head

Pacific Aviation, Inc., 9900 Lincoln Blvd., Los Angeles 45, is manufacturing a "hydromat" drill head for drilling, milling, boring, tapping and turning. Has air-hydraulic feed and drills holes from No. 80 drill up to 3-in. diameter, bores up to 6-in. diameter. Has any required length of feed and deep hole step drilling is easily accomplished through air valving.

Electrode

Westinghouse Electric Corp., P.O. Box 868, Pittsburgh 30, has developed an electrode for welding mild steel in all positions and with alternating-current or either polarity direct-current, straight preferred. Available in four diameters from $\frac{3}{16}$-in. to $\frac{5}{16}$-in.

Paint

Miler Corp., Garland Bldg., Chicago, announces a paint that will permit speedy application, has durable, weather-resistant qualities and dries quickly. This is an unusual paint in that application is recommended by merely wiping it on the surface with an ordinary soft, lint-free cloth rather than by brush, although the latter may be used if desired. Painted surface is perfectly smooth with no "brush marks." Applicable for both wood and metal surfaces. Will dry dust-free within one hour and completely dry in three hours.

Pallet Truck

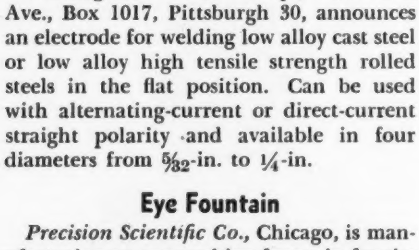
Lewis-Shepard Products, Inc., 328 Walnut St., Watertown 72, Mass., is producing a compact, easy to handle and rugged pallet truck which plastic wheels can be substituted for standard metal wheels at the end of the forks as well as at the front. These trucks are light in weight but maximum strength is attained due to their design and one-piece box section frame. Equipped with "spring-lift" booster rollers mounted in back of the rear wheels. The forward lowering makes load spotting quick and accurate. The hydraulic lift is operated through a selective length stroke double foot pedal permitting easy operation from either side of the truck. Built in capacities ranging from 1000 to 6000 lb. and is adaptable to either single or double, 2-way or 4-way pallets.

Electrode

Westinghouse Electric Corp., 306 Fourth Ave., Box 1017, Pittsburgh 30, announces an electrode for welding low alloy cast steel or low alloy high tensile strength rolled steels in the flat position. Can be used with alternating-current or direct-current straight polarity and available in four diameters from $\frac{5}{32}$-in. to $\frac{1}{4}$-in.

Eye Fountain

Precision Scientific Co., Chicago, is manufacturing an eye washing fountain for the immediate flushing of eyes that have been exposed to irritating vapors, liquids, dusts, chemicals or smoke. It is essentially a double fountain with standard inlet and drainage connections. The openings are so arranged that two streams of water are simultaneously directed against the eyes. Water pressure can be regulated so that a soft stream is produced assuring a copious but easy flow. The cast aluminum bowl is designed to fit the upper contours of the face. The actuating valve is operated merely by resting the head on the upper portion of the bowl; this type of operation makes it necessary to keep the eyes in the ideal range of the streams of water.



Hand-Guided Tractor

The Yale & Towne Mfg. Co., Philadelphia, has designed an intraplant towing unit in which electric storage battery power does the hauling but the operator guides, maneuvers and walks the load. The unit has ample power for hauling heavy trailer loads. Its three wheels are all 10-in. in diameter with 5-in. rubber tires for full traction and smooth pulling. With only 30-in. between rear and forward axles, short turning radii are a feature.

Grinding Wheel

The Carborundum Co., Niagara Falls, N.Y., is manufacturing a new type of grinding wheel constructed of the proper abrasive and bond to give optimum results in grinding. The wheel provides seven advantages in that it gives faster stock removal; less grinding labor hours; fewer damaged tools; longer tool life; less heat generation; better tool finishes and smaller inventories.

Micrometer

Tubular Micrometer Co., St. James, Minn., has an instrument unlike conventional solid frame micrometers whose weights, especially in larger sizes, tend to increase operator's fatigue with resultant inaccuracies in measurements, the hollow or tubular frame instruments can be handled with minimum effort. Other features include a wear take up spindle bushing assembly which compensates for wear at the frame; both the spindle and anvil are hardened to Rockwell 64-C to reduce wear; micrometer graduations and numerals are large and easy to read and components of the hollow micrometer are made of high grade alloy steel. Micrometers are furnished in a variety of types for numerous measuring requirements.

Order Chart

Industrial Chart Co., 2907 East Linnwood Ave., Milwaukee 11, has developed an "economical order quantity chart" which enables an order clerk to determine quickly and easily the most economical quantity of an item to manufacture. It is a mathematical balance of the various costs involved and limitations desired, and permits direct reading of the proper quantity to order, so that the most economical lot size can be determined by any clerk in a matter of seconds.

Cutting Fluid

The Penetone Co., Tenafly, N.J., has developed a cutting fluid that combines the three essential requirements of lubrication, cooling, and cleaning, plus gentleness to the hands. This product is a liquid concentrate, non-inflammable and non-toxic, which is diluted with approximately 15 parts of water for use as a cutting fluid.

PERSONALITIES

(Continued from Page 59)

Chairman, Technical Research Committee, **H. S. Avery,** research metallurgist, American Brake Shoe Co. **H. A. Cooper,** president, The Cooper Alloy Foundry Co., and **J. D. Corfield,** vice-president, Michigan Steel Casting Co., were elected to the board of directors for three-year terms.

Dr. E. W. Cannon has been appointed chief, machine development laboratory, National Bureau of Standards, Washington 25, D.C. An electrical engineer and a mathematician, Dr. Cannon received his Bachelor of Arts degree from University of Delaware in 1928 and his Masters in 1931, both in electrical engineering. His doctorate, conferred by Johns Hopkins in 1935, was in applied mathematics.

Wallace Everette Pratt, former vice-president, Standard Oil Co. (N.J.) from 1942-45 is to be awarded the Anthony F. Lucas Petroleum Gold Medal at the Annual Meeting of the American Institute of Mining and Metallurgical Engineers in New York City, February, 1948. The medal is being presented to Mr. Pratt for "distinguished achievement in improving the technique and practice of finding and producing petroleum."

W. J. Farischon has been appointed news editor for Caterpillar Tractor Co., Peoria, Ill. He has been associated with the firm's news service since January, 1946, and, prior to the recent war, had a background of 13 years in newspaper work. During the war, Mr. Farischon served more than three years in mechanized cavalry and saw combat in the European theater. As news editor, he succeeds **Jerry Reichart,** who resigned to accept the position of editor of employee publications at Cutter Laboratories, Berkeley, Calif. **Jerry Cook** has joined the staff as news writer. A graduate of the University of Illinois, Urbana, Mr. Cook served as public relations officer with the army during the war, and since has been in public relations work with the Veteran's Administration in Illinois.

Max Hansen has been given the position of associate professor of metallurgical engineering at Illinois Institute of Technology, Chicago. Professor Hansen was formerly director of research for the Durener Metallwerke at Duren, the organization that introduced aluminum alloys, and was at one time associated with Gottingen University, Gottingen, Germany and also the Technical University of Berlin.

R. R. Kerr has been named advertising manager of the valve and Saginaw divisions of Eaton Mfg. Co., Detroit. A member of the sales department since 1945, he had previously been with the planning staff. Mr. Kerr joined the Eaton firm in 1942.

Henry J. Kozlowski is on leave of absence for one year from the physical metallurgy research laboratories, Bureau of Mines,

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PERSONALITIES

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Ottawa, Ont., to undertake post-graduate studies towards his Master's degree in the department of metallurgy, University of Birmingham, Birmingham, England.

Dr. John H. Curtiss, who has been the director's assistant in applied mathematics at the National Bureau of Standards, has been named chief of the recently established national applied mathematics laboratories at the Bureau. Dr. Curtiss received his Bachelor of Arts from Northwestern University in 1930, his Master of Science degree from the Iowa University in 1931, and his doctorate from Harvard in 1935.

Dr. Frederick Seitz and Dr. Roman Smoluchowski, Carnegie Institute of Technology, Pittsburgh, Pa., have been appointed members of the newly organized Committee on Solid State in the Division of Physical Sciences, National Research Council.

Dr. Seitz is the head of the physics department, while Dr. Smoluchowski is an associate professor of metallurgical engineering.

Obituaries

Barney Castor, 59, master mechanic, National Engineering Co., Chicago, died September 3 at Minocqua, Wis., following a long illness. Mr. Castor had been actively associated with National Engineering for the past 31 years.

Charles W. Kucher, founder and president, Olympic Foundry Co., Seattle, Wash., died recently in Seattle. The deceased was the father of Ronald E. Kucher, vice-president, Gray Iron Founders' Society.

H. J. Bassett, president and general manager, Galt Malleable Iron Co., Ltd., Galt, Ont., died recently.

C. F. Snyder, founder and past president, Snyder Foundry Supply Co., Los Angeles, died recently.

Luther E. Roby, president, Peoria Malleable Castings Co., Peoria, Ill., died July 30.

Lawrence G. Pritz, 59, president and founder, Ohio Ferro Alloys Corp., Canton, Ohio died September 12. He had been one of the early pioneers in the electric furnace steel production having been connected with the Illinois Steel Corp., Timken Roller Bearing Co. and United Steel Company before establishing the Ferro Alloys concern.

George M. Berry, 69, industrial metallurgist, died recently in Syracuse, N.Y. He taught metallurgy and foundry practice at Syracuse University from 1917 until his death. Mr. Berry has been associated with the Halcomb Steel Co. plant in Syracuse as chief chemist for many years.

Scrub Foundry Air

With the
Thunderhead Turbulence
of a Schneible Collector

A Schneible system clears the air like a brisk summer thunderstorm . . . rids your foundry of dust and fumes permanently. Center of activity is the Schneible Multi-Wash Collector in which the uprush of contaminated air through the various impingement stages comes into cyclonic contact with the gravity-fed wash water. It's as natural as a thunderstorm, too—there are no moving parts to require repair or replacement.

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That's the core . . . leading to it and from it are the Schneible hoods, ductwork, "Velocitraps," settling and dewatering tank, and pumps that assure clean air in every corner of your foundry and easy, economical disposal of collected material. Find out about the hundreds of Schneible engineered installations giving automatic, trouble-free handling of contamination in foundry air. Send for Bulletin 47.

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ABSORPTION
CONDENSATION AND TEMPERATURE REDUCTION

CHAPTER ACTIVITIES

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the scene of the official inauguration of the thirty-seventh chapter of the American Foundrymen's Association—the British Columbia chapter. In the presence of 120 members and visitors who gathered October 7 to attend the ceremonies, A.F.A. National President Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va., expressed what an honor it was to welcome to the Association this third Canadian group. He pointed out the advantages and services offered through A.F.A. membership and explained the aid received by attending local chapter meetings.

Norman Terry was then installed as chairman of the new chapter. In accepting the position, Mr. Terry thanked the A.F.A., and President Kuniansky for the assistance rendered the organization and called on the membership to support their chapter officers and directors in every way they could, so as to help make the chapter a success. Mr. Terry then introduced the new officers and directors of the chapter as well as a number of committee chairmen.

Following the installation ceremonies, Mr. Kuniansky gave a very interesting illustrated address on "Chemically Treated Sand."

Northeastern Ohio

Pat Dwyer
Penton Publishing Co.
Chapter Reporter

A GROUP of national officers attending the Oct. 9 meeting of the Northeastern Ohio Chapter of the A.F.A. at the Cleveland Club, Cleveland, included Vice President W. B. Wallis, president, Pittsburgh Lectromelt Furnace Corp., Pittsburgh; W. W. Maloney, secretary-treasurer, and H. F. Scobie, educational director, national headquarters, Chicago, and E. N. Delahunt, general superintendent, Warden King Ltd., Montreal, a national director. Seats at the speaker's table also were occupied by Thomas Begg and Douglas Leishman, representing Metter's Ltd., Sydney, Australia, at present on a tour of inspection and observation through United States foundries. Others at the head table included Chapter President H. C. Gollmar, Elyria Foundry Div., Industrial Brownhoist Corp., Elyria; Chapter Vice-President E. C. Zirzow, National Malleable & Steel Castings Co., Cleveland; Central Ohio Chapter Vice-Chairman F. W. Fuller, National Engineering Co., Columbus; A. A. Hilbron, A.F.A. Exhibits Manager, Chicago; John Murray, advertising manager, AMERICAN FOUNDRYMAN, Chicago; and Pat Dwyer.

Annual Convention Plans

Mr. Maloney discussed briefly the coming Philadelphia convention, May 3 to 7, 1948. Mr. Scobie outlined the procedure covering the preparation of papers desired to be presented at the convention. Mr. Wallis presented a resume of his recent tour of many European countries, and included observations on general conditions, social and industrial. In the speaker's opinion, while conditions by no means are back to normal, they are not quite as deplorable as the majority of published reports would seem to indicate.

Main address of the evening, under the title "Chemically Coated Sand," was delivered by Norman J. Dunbeck, vice president, Eastern Clay Products, Inc., Jackson, Ohio. In an exceptionally interesting manner he dealt with practically every phase of this comparatively recent development in foundry practice. The new liquid plastic of rather low viscosity essentially is a resin dissolved in a solvent and is water soluble. Sand first is coated by mixing it with the plastic in an ordinary foundry mixer and then passing it through a rotary drier at 350° F. The resulting material is non-thermo setting and extremely refractory, will not fuse and will burn without any ash. The action is regulated by a catalyst in the coating.

At a separate meeting of the chapter's patternmaking division, J. J. Parker, SPO Inc., Cleveland, discussed the importance of good pattern equipment in operation of molding machines. George J. Gedeon, Aluminum Co. of America, presided. Mr. Parker described in detail the different types of commonly used molding machines and

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ELYRIA FOUNDRY

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essary to supply a wide variety of high alloy steels for heat, corrosion and wear resistance.

The core room has a separate sand conditioning unit with overhead conveyor belt for distributing prepared mixtures to benches, a core blower and a floor jolt machine. Baking is done in automatically controlled rack type and car type core ovens.

The centrifugal casting department can produce vertical axis castings up to four feet in diameter. The horizontal axis equipment permits production of castings up to 17 inches OD by 12 feet long.

Below—Castings awaiting annealing and heat treating in the semi-muffle type heat treating furnace (center) or car type furnace in the left background.

Two heat treating furnaces provide for all types of heat treatment. Heat treat operations are under supervision of the plant metallurgical department.

Layout of the finishing department provides for production line handling of castings from rough inspection through grinding, chipping, tumbling, blasting, welding and heat treating, finish sand blasting and finally physical testing. Composite assemblies are made by electric arc, atomic hydrogen and oxyacetylene welding.

Exterior view of the x-ray department showing castings marked and ready for inspection.

Reporting directly to the metallurgical department, the inspection department uses two industrial x-ray units with capacities of 200 Kv and 250 Kv housed in two concrete operating rooms adjoining a dark room, viewing room and film file. X-ray, ultra violet inspection and final inspection are all coordinated with finishing operations.

The plant has a complete chemical laboratory, a sand laboratory and a physical laboratory, all under the supervision of the plant metallurgist. The metallurgical department is separate from but works closely with the engineering department. These laboratories work closely with the Brake Shoe research center in Mahwah, N. J.

WEST COAST TRIP

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heard Mr. Knight's valuable talk.

The following day the two A.F.A. officials attended a meeting of the chapter's board of directors at which Chapter Chairman H. E. Russill, Eld Metal Co., Ltd., Los Angeles, presided. Numerous questions were asked and answered concerning chapter operations and means of maintaining chapter membership interest. Later, President Kuniansky addressed a special meeting of top management. He called attention to the great foundry opportunities in California, whose population has increased 100 per cent in the past ten years. Operations of the National Organization and their effect on the local chapter were emphasized by the Secretary.

In concluding this trip President Kuniansky stated that, in his mind, he is convinced that the West Coast chapters are well-founded and organized and that they are intensely interested in bringing their membership greater information on the production and quality of cast metals. He expressed the hope that more foundry operators from the eastern states would visit the Pacific Coast in the near future, not only to speak before the established chapters there, but also to see for themselves that the West Coast foundry industry is well equipped to serve the needs of a steadily expanding western industry.

English Firm Markets Metal Casting Set

A FIRM IN England has developed, patented and is manufacturing a hobby set which enables boys to make metal castings in the same manner as in a modern foundry. The set gives practical training in actual foundry work as it teaches the youth the art of making a mold, forming runners and pouring.

This is not a lead casting set, the metal used hardens within a minute and can be sawn, drilled, filed and polished like other metals. The metal is safe to handle in that one can immerse his fingers momentarily in it without discomfort and it will not injure clothing or carpets if spilt. Colored castings can be made in blue, red, yellow or green.

CHAPTER ACTIVITIES

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the pattern requirements of each. He indicated that a jobbing shop needs a good patternmaker—one who is adept at the proper mounting of patterns used in machine molding.

Central New York

J. A. Feola
Crouse-Hinds Co.
Publicity Chairman

IF CORE departments are to operate successfully they must set up laboratories for control, carefully select the materials used, use weight as a basis for mixtures, make sure all cores are properly baked, establish a system of venting and inspect all cores before they enter the molding department. These remarks were incorporated in an address delivered by L. P. Robinson, Werner G. Smith Co., Cleveland, as he spoke to 100 members and guests of the Central New York chapter, October 10 at the Onondaga Hotel, Syracuse, N.Y.

According to the speaker many core rooms still use wheelbarrows or boxes to measure sand and gallon cans and other containers to measure core oils, which all add up to bad core room practice and ends up with faulty castings being produced.

In answer to the question of increased cost of cores, Mr. Robinson stated that the savings in the molding and inspection departments and less rejects in the machine shop would more than offset the added expense in the core room.

Chapter Vice-Chairman C. M. Fletcher, The Fairbanks Co., Binghamton, N.Y., presided over the meeting.

E. Canada & Newfoundland

Henry Louette
Warden King Ltd.
Vice-Chairman, Publicity Committee

THE FIRST SPEAKER of the 1947-48 chapter season for the Eastern Canada and Newfoundland chapter was Dr. R. L. Lee, General Motors Corp., Detroit. Meeting at the Mount Royal Hotel, Montreal, October 14, more than 150 members and guests gathered to hear Mr. Lee's address "Man to Man on the Molders Bench."

His talk was built around his extensive studies of human nature and

Dr. R. L. Lee, General Motors Corp., Detroit, speaking before the Eastern Canada and Newfoundland chapter.

human characteristics. This furnished a great deal of wit and humor and plenty of food for thought. He said human beings, like metal alloys, have their own characteristics and require special heat treatments or methods of handling.

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CHAPTER ACTIVITIES

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Thomas Curry (second from left), Lynchburg Foundry Co., Lynchburg, Va., relaxing with Birmingham chapter officers before he spoke at the October 17 meeting. Seated (starting left) are Chapter Chairman W. E. Jones, Stockham Pipe Fittings Co.; Mr. Curry; Chapter Director and Past Chairman J. T. Gilbert, Stockham Pipe Fittings Co.; and Membership Chairman D. C. Abbott, Hill & Griffith Co.

Mr. Lee commented that while most foundries are well equipped with laboratories and all types of measuring instruments, there is absolutely no way of judging the human element. He did explain, however, that there are several factors regarding human behavior, which when properly co-ordinated and applied, knit a group of individuals into a smooth functioning organization. He emphasized that the same kind of fact-finding honesty and ingenuity so successfully employed in solving mechanical problems, will produce even greater results in terms of employee relations when applied to human behavior.

Chapter Chairman A. E. Cartwright, Crane Ltd., Montreal, presided and James Newman, Newman Foundry Supply Ltd., Montreal, introduced the guest speaker.

Detroit

Charles Rittinger
American Car & Foundry Co.
Publicity Chairman

ATTENDING THE first meeting of the Detroit chapter, October 16 at the Horace H. Rackham Educational Memorial were 165 members and guests. Seated as the presiding officer was Chapter Chairman Wm. W. Bowring, Frederic B. Stevens, Inc., Detroit.

The coffee talker was George N. Sieger, president, S.M.S. Corp., De-

Neil Wilcox, Electric Steel Foundry Co., Portland, commenting on centrifugal casting at the October Oregon chapter meeting.

troit, and vice-chairman, American Welding Society.

Following the coffee talk, the meeting broke up into three round table discussions, namely, steel, aluminum and gray iron.

H. W. Schroeder, works manager, Michigan Steel Casting Co., Detroit, was the speaker at the steel session and his topic was "A Study of Heading and Gating Practice." The talk reviewed the work done by a number of Steel Founders' committees. A series of slides were shown during the talk. Acting as discussion leader was R. J. Wilcox, metallurgist, Michigan Steel Casting Co.

Aluminum foundrymen heard A.F.A. Aluminum and Magnesium Division Chairman Walter Bonsack, director of laboratories, National Smelting Co., Cleveland, present a "Discussion on Casting Defects." During the course of his talk, slides were shown of defects and means of remedying. The discussion leader was Dr. R. F. Thompson, International Nickel Co., Detroit.

"How Specifications Are Made and Met" was the subject of R. G. McElwee's address. Mr. McElwee, affiliated with Vanadium Corp. of America, Detroit, as manager, foundry alloy div., is Chairman, A.F.A. Gray Iron Division. The speaker stressed the importance of calculating the carbon in the charge.

Birmingham District

J. P. McClendon
Stockham Pipe Fittings Co.
Publicity Chairman

Thomas W. Curry, metallurgist, Lynchburg Foundry Co., Lynchburg, Va., spoke to approximately one hundred foundrymen and guests on "Chemically Treated Sand" at the Tutwiler Hotel, Birmingham, on October 17.

Over eighty attended the dinner honoring Mr. Curry prior to his talk at the technical session. W. E. Jones, Stockham Pipe Fittings Co., chapter chairman, presided at both the dinner and technical session. Dr. James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, introduced the speaker.

Mr. Curry spoke in detail of the experiments and laboratory tests that lasted for over a year before the Lynchburg Foundry decided to go into full production using the chemically treated sand.

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BOOK REVIEWS

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mention of non-ferrous castings. It is probably a minor fault of the book that centrifugal casting is described as being limited to castings essentially symmetrical about the axis of rotation.

A Bibliography on Die Casting, by Editors of *Die Castings.* 74 pages. Price $7.50. Technical Publishing Company, Cleveland. 1947.

This compilation of more than 1200 references covers American, British, French and German literature from 1915 through 1946. Product designers, research workers, metallurgists, technical librarians, production engineers and others interested in die castings and processes will find this bibliography helpful.

The book is conveniently divided under eight subject headings covering: alloys, applications and uses; design; finishing; general data; machines; process, and properties.

STATEMENT OF OWNERSHIP

Statement of the ownership, management, circulation, etc., required by the acts of Congress of August 24, 1912, and March 3, 1933, of AMERICAN FOUNDRYMAN, American Foundrymen's Association, published monthly at Chicago, Ill., for October 1, 1947, State of Illinois, County of Cook, ss. Before me, a notary public in and for the state and county aforesaid, personally appeared Wm. W. Maloney, who, having been duly sworn according to law, deposes and says that he is the Editor of the AMERICAN FOUNDRYMAN, American Foundrymen's Association, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, to-wit: 1—That the names and addresses of the publisher, editor, managing editor, and business managers, are: Publisher, American Foundrymen's Association, Inc., Chicago, Ill.; Editor, Wm. W. Maloney, Chicago, Ill.; Managing Editor, G. R. Buhler, Chicago, Ill.; Business Managers, None. 2—That the owner is American Foundrymen's Association, Inc., not for profit; stock, none. Principal Officers: Max Kuniansky, President, Lynchburgh Foundry Co., Lynchburg, Pa.; Wm. W. Maloney, Secretary-Treasurer, Chicago, Ill. 3—That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None. 4—That the two paragraphs next above, giving the names of the owners, stockholders, and the security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholder's and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. Wm. W. Maloney, editor. Sworn to and subscribed before me this 1st day of October, 1947. (Seal) C. L. Reilly, notary public. (My commission expires March, 1952.)